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THE CONDOR

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BREEDING BIRDS OF THE FOREST EDGE IN ILLINOIS

By VERNA R. JOHNSTON

The forest edge is a meeting place of two distinct communities, forest and grassland, and combines many characteristics of each. This study was made to determine if the avifauna of the forest edge was sufficiently different to constitute a community unit distinct from either the forest interior or open country and to analyze avian responses to the "edge" habitat. Lay (1938) and Beecher (1942) have shown the relation between edge and increased population densities of birds in any area. Shelford (1927:262) presents a good description of the original extent of forest edge in Illinois: "The forest margin or edge is a familiar natural situation. About Chicago there are groves of trees which are probably exactly as they were before settlement. The forest ends: the prairie begins. The line between the two is markedly a narrow border of shrubs and rank weeds, usually only a few feet wide. In other places the forest ends at a marsh side, lake side, or stream side, but almost always with the thicket of shrubs and rank weeds. A remarkably large number of animals belong to this forest margin."

As these forests are cut up into fragments and the prairies plowed right to the edge of the forest, the natural forest edge disappears. If undisturbed, however, in a short time shrubs, seedlings, and vines sprout along the outer border of the remaining forests. There are now many small, scattered islands of forest, exposed to open fields on all sides, with a very narrow border of small trees and shrubs and weeds. Young trees and shrubs are prevented from broadening the forest border by cultivation. But essentially the same type of habitat occurs "along the wooded streams into the great plains and toward the east through the forest area, as the shrubby bluff, the creek and river margin, the fired area, and the marsh margin" (Shelford, 1927:275). It is found along roadsides, fence-rows, and in pastures and open woods. In all these places, a forest-edge habitat which comes into existence through man's activities appears as much like the natural forest edge as can be formed under modified conditions. Among themselves, these forest edges vary in character according to the extent to which they are burned, cut, grazed, fenced in, and disturbed in general, and according to their relation to neighboring habitats such as forest, water, or fields. Together or individually, these factors will influence the character of the habitat and the composition of the avifauna.

This study of the forest edge was made during the summer of 1943 in two oak-maple forests at Urbana, Champaign County, Illinois. The two tracts, Trelease Woods and Brownfield Woods, total 56 acres and 64 acres, respectively. They are marked out into squares by permanent stakes set 50 meters (162 feet) apart. On each field trip the observer went around the area looking into the forest and counting the birds in the forest edge, then walked back and forth through the interior of the forest following the stakes and mapping the location of all species seen. All surveys were made in the morning and total 53 hours at Trelease Woods between April 18 and August 12, and

38 hours at Brownfield Woods between June 17 and August 11. Surveys totaling about half of the hours at Trelease Woods were conducted by S. C. Kendeigh and H. C. Siebert, University of Illinois, whose assistance is gratefully acknowledged. Suggestions and helpful criticisms were made by S. C. Kendeigh throughout this study.

Description of study areas.—Trelease Woods and Brownfield Woods are mesophytic forests, flat, rectangular tracts, relatively undisturbed, with tall mature trees, good undergrowth, and poor drainage. Both are bordered on all sides by farmland or country roads and their vegetation is practically identical. Red oak (*Quercus borealis*) and sugar maple (*Acer saccharum*) are the dominant trees, with numbers of burr oak (*Quercus macrocarpa*), slippery elm (*Ulmus fulva*), hackberry (*Celtis occidentalis*), American elm (*Ulmus americana*), linden (*Tilia americana*), hickory (*Carya* sp.), red haw (*Crataegus* sp.), and black cherry (*Prunus serotina*) present. Seedlings of these trees, along with spice bush (*Benzoin aestivale*) and pawpaw (*Asimina triloba*) constitute the shrub stratum.

The forest edge is a narrow strip extending around the area, 1.25 miles long in Trelease and 1.4 miles long in Brownfield Woods. It is moderately well developed in the northeast corner of Trelease Woods, where haws, blackberries (*Rubus* sp.), sumac (*Rhus glabra*), and seedlings have formed a natural shrubby growth; but elsewhere in both woods the edge varies from a thin, closed canopy to a wide opening exposing the interior. Around the entire border of Trelease and on two sides of Brownfield Woods occurs a narrow grass-weed strip which is cut annually and meets the forest trees abruptly. In the northwest corner of Brownfield Woods is a rectangular area of this same grass-weed vegetation; the edge is closed chiefly by seedlings and hanging limbs of trees. The edge really extends inward a short distance at a decreasing height as well as outward because the forest meets the open country so abruptly.

For comparative purposes another form of forest edge was censused. This was a narrow isolated strip of trees and shrubs along a creek near Trelease Woods. Here there was no forest interior. The area was pastured and the vegetation consisted of scattered willows (*Salix* sp.), sycamores (*Platanus occidentalis*), honey locust (*Gleditsia triacanthos*), elm, hawthorns, rose bushes (*Rosa* sp.), poison ivy (*Rhus toxicodendron*), smilax (*Smilax* sp.), grapevines (*Vitis* sp.), and an abundance of weeds.

In order to compare the birds of the forest interior in Trelease and Brownfield woods with those of a more extensive tract, the unbroken forest at Turkey Run State Park, Indiana, was used. In the section of the forest studied there is no man-made forest edge, although the forest ends abruptly along streams, cliffs, and deep gorges. The forest consists of beech (*Fagus grandifolia*), sugar maple, black cherry, dogwood (*Cornus florida*) and tulip trees (*Liriodendron tulipifera*).

FOREST-EDGE SPECIES

In the present study forest-edge birds are considered to be those species which are confined to the border of the forest or which use both the forest and the surrounding field in their activities. Some species penetrated only a short distance into the woods and seldom far into the fields, while others ranged widely into the surrounding country and nested either deep in the forest or near its border.

Figure 7 illustrates the territories of representative species that are confined to the forest edge in all their activities. The census maps show how points where birds were observed on successive dates aggregate into distinct groups, indicating the identity of particular adults on their territories. Other species use the forest interior and forest edge indiscriminately (figs. 8 and 9); still others occur principally in the forest interior

(fig. 9). Such species as the crow and starling nest in the woods but forage often at considerable distances in the surrounding open country.

Densities of the breeding populations on the two study areas are given in table 1. The density of the total population of each forest is not given. Kendeigh (1944:94) has

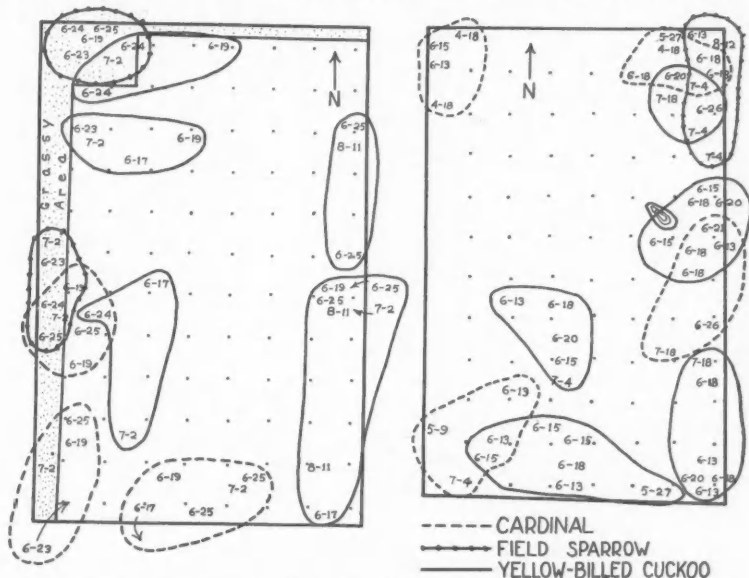


Fig. 7. Composite census maps for Cardinal, Field Sparrow, and Yellow-billed Cuckoo, forest-edge species; figures indicate dates when observed. Left, Brownfield Woods; right, Trelease Woods. Both areas are staked off at 50-meter intervals, as shown.

pointed out that when one analyzes the population by species, such an expression of density is not justified. The density of species whose activities are confined to the forest should be separated from the density of the forest-edge species. According to Kendeigh, density of the forest population is best expressed as pairs per 100 acres, and the forest-edge population in pairs per mile, since the narrow forest edge is usually without significant breadth. Species which occurred in both the forest interior and the forest edge were placed according to the location of the territories of pairs into whichever group they fit. Thus, in the case of the Crested Flycatcher at Trelease Woods, four pairs were considered interior birds and three pairs forest-edge species (see fig. 9).

It will be noted in table 1 that on the basis of total numbers of pairs, the forest edge in both woods has a greater total than the forest interior. Lay (1938:256) found this true in a Texas woodland, and it is a generally known fact that numbers of birds are greater in forest-edge habitats than in dense woods. Kendeigh (1944:97), after a study of the relative densities of forest-edge and forest-interior birds in fifteen widely scattered areas, concluded that "a census is very likely not to show the true density of forest-interior birds if forest-edge birds constitute more than one-third of the total population." In this study of Trelease and Brownfield woods, forest-edge species made up 63 per cent of the total population. Doubtless the amount of exposure to open country around the edge of these two areas is important and may account for the infiltration

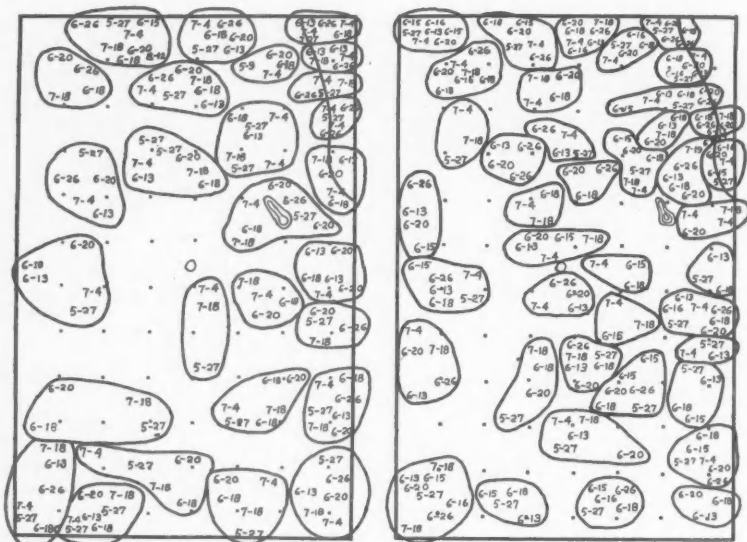


Fig. 8. Census maps for Trelease Woods. Left, Indigo Bunting; right, House Wren. Note occurrence both in the interior and at the edge.

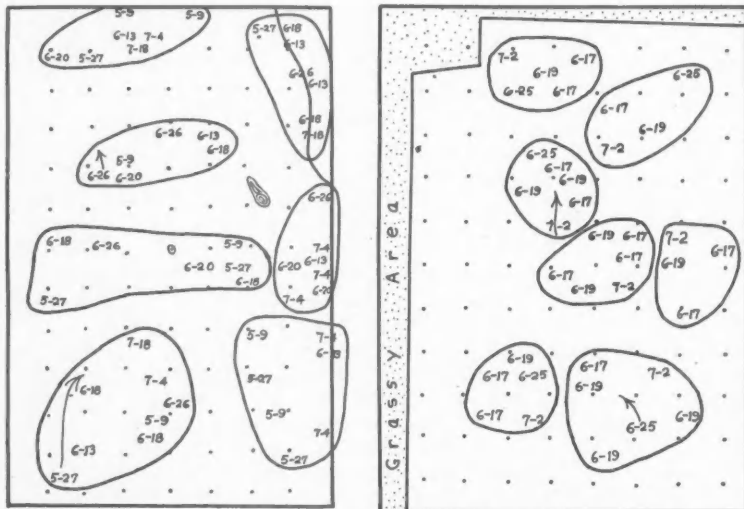


Fig. 9. Left, map for Crested Flycatcher in Trelease Woods, showing occurrence of 3 pairs at edge and 4 in the interior. Right, map for Red-eyed Vireo at Brownfield Woods, showing occurrence in interior only.

of the forest-edge species like the House Wren and Indigo Bunting. "Or the larger percentage of forest-edge species may simply indicate that the community or habitat is no longer a true forest one and is changed in various ways that are less favorable for forest birds" (Kendeigh, 1944:97) or, at least, more favorable for forest-edge species.

In the pastured creek margin near Trelease Woods which was censused for comparative purposes, ten species were regularly recorded, nine of which were also edge inhabitants of Brownfield and Trelease woods, namely, Mourning Dove, Field Sparrow, Cardinal, Goldfinch, Blue Jay, Robin, Yellow-billed Cuckoo, Crested Flycatcher and Indigo Bunting. The Brown Thrasher (*Toxostoma rufum*) is the only species recorded in the

Table 1

Number of Pairs of Breeding Birds of the Forest Edge (FE) and Forest Interior (FI) in 1943

Species	Trelease Woods			Brownfield Woods		
	FE	FI	Total	FE	FI	Total
Cooper Hawk, <i>Accipiter cooperii</i>	1	0	1	0	0	0
Mourning Dove, <i>Zenaidura macroura</i>	0	0	0	1	0	1
Yellow-billed Cuckoo, <i>Coccyzus americanus</i>	4	1	5	5	0	5
Ruby-throated Hummingbird, <i>Archilochus colubris</i>	♂	♀	1	♂	♀	1
Yellow-shafted Flicker, <i>Colaptes auratus</i>	1	0	1	1	0	1
Red-bellied Woodpecker, <i>Centurus carolinus</i>	0	1	1	0	2	2
Red-headed Woodpecker, <i>Melanerpes erythrocephalus</i>	1	0	1	1	0	1
Hairy Woodpecker, <i>Dryobates villosus</i>	0	1	1	0	3	3
Downy Woodpecker, <i>Dryobates pubescens</i>	0	6	6	0	5	5
Crested Flycatcher, <i>Myiarchus crinitus</i>	3	4	7	4	2	6
Wood Pewee, <i>Myiochanes virens</i>	3	5	8	5	0	5
Blue Jay, <i>Cyanocitta cristata</i>	1	0	1	1	0	1
Crow, <i>Corvus brachyrhynchos</i>	9	0	9	9	0	9
Tufted Titmouse, <i>Parus bicolor</i>	0	3	3	0	4	4
House Wren, <i>Troglodytes aedon</i>	25	15	40	23	14	37
Carolina Wren, <i>Thryothorus ludovicianus</i>	0	1	1	0	1	1
Robin, <i>Turdus migratorius</i>	0	0	0	4	0	4
Wood Thrush, <i>Hylocichla mustelina</i>	0	2	2	0	4	4
Starling, <i>Sturnus vulgaris</i>	15	0	15	15	0	15
Red-eyed Vireo, <i>Vireo olivaceus</i>	0	10	10	0	7	7
Ovenbird, <i>Seiurus aurocapillus</i>	0	1	1	0	0	0
Kentucky Warbler, <i>Oporornis formosus</i>	0	0	0	0	2	2
Yellow-throat, <i>Geothlypis trichas</i>	3	0	3	2	0	2
Cardinal, <i>Richmondia cardinalis</i>	3	0	3	3	0	3
Indigo Bunting, <i>Passerina cyanea</i>	18	9	27	9	3	12
Goldfinch, <i>Spinus tristis</i>	3	0	3	2	0	2
Field Sparrow, <i>Spizella pusilla</i>	1	0	1	2	0	2
Total pairs	91.5	59.5	151	87.5	47.5	135
Total species	16	14	24	17	12	25
Density per 100 acres		106			74	
Density per mile	73			62.5		

pasture and not in the woods, and it nested in a roadside stand of thick shrubs near Brownfield Woods. Thus, nine species were found in both areas of forest edge; an additional one was present in shrubby pasture; four additional species were present in the forest border of Brownfield and Trelease woods. This situation is to be expected when the faunas of two forest edges are compared: most common species will occur in both habitats, but, because of some environmental differences, each area will have some additional species conspicuously present or absent. If the census areas were of larger size and had the same facilities, perhaps there would be complete correspondence.

In an analysis of forest-interior species, it was found that all species which occurred exclusively in the forest interior of Trelease and Brownfield woods, with the exception

of the Hairy Woodpecker, occurred in the forest interior of the larger unbroken tract at Turkey Run. In addition, the Turkey Run forest included the Crested Flycatcher and Wood Pewee which are found in both the interior and edge at Trelease and Brownfield woods and the Flicker, Robin, and Cardinal.

BEHAVIOR ADJUSTMENTS

Why some species are restricted to, or are common in, one community and absent or uncommon in another is a question which arises often in ornithological studies. Various answers have been offered to this question of community selection. First, there may be coincidental agreement in environmental relations between a species and the community in which it occurs; "this may be due to coincidence in limits of tolerance to extremes in environmental conditions by species and community" (Kendeigh, 1945:418). Second, differences in micro-climate may occur between different parts of a community or between different communities to which the species responds (Kendeigh, 1945). And third, there may be some obligatory relation of the species to a particular community (Trotter, 1912; Pitelka, 1941; Kendeigh, 1945); this obligatory relation may involve the occurrence within the community of a particular niche that the species requires, such as will be shown here for the Field Sparrow.

In this study, species were classified according to three main types of community selection: those confined in their activities entirely to the forest edge, those inhabiting both edge and interior, and those confined to the forest interior. All evident reasons for community selection were analyzed carefully through observation of responses and behavior of each species to the forest edge or the forest interior. Factors influencing habitat restriction, such as food, feeding habit, singing post, nesting site, nest materials, and roosting place, were noted for each species insofar as possible. A species may be limited in its habitat distribution by any one or more of these factors (Lack and Venables, 1939). The behavior adjustments of six species proved particularly interesting.

Field Sparrow.—In this study and in previous studies of four Field Sparrow nests, it seemed apparent that the exact site of the nest itself is exceedingly variable. Walkinshaw (1936) found nests placed in grass, sorrel, or clover just above the ground, in blackberry bushes, and in young oak trees—"in fact any type of dense, short vegetation in any open field or on a dry side-hill might be a nesting site of the field sparrow." The important factor appears to be the availability of shrubs, trees, fences, or other objects which stand higher than the surrounding vegetation. From these posts the male can sing, keep watch on the nest, and chip when intruders approach. To these perches the female flies when flushed, and from them she flies to the nest with food for the young. The exact height and form (tree, shrub, post, or wire) apparently is insignificant, as long as the post provides a view of the nest and is near enough for the bird to chip at invaders. The low outer branches of tall mature trees, 15-20 feet away, served the purpose nicely for three nests observed near Cerro Gordo, Illinois, in 1940-41; tall trees approximately this same distance from the nest were used in a similar manner by a pair of Field Sparrows breeding on the border of a wood near Dune Park, Indiana, in 1943; a barbed wire fence around Brownfield and branches of the trees along the edge were utilized by the pair observed in this study. The grasses used as nesting material are widely available, and food is not a limiting factor. Hence, the singing and lookout posts in or near a relatively open situation providing some ground cover appear to be the only limiting habitat requirements of this species. These are obviously not too restricting, and shrubby fields, open woods, borders of forests, and roadsides all furnish just such conditions.

The three pairs of Field Sparrows studied in Brownfield and Trelease woods confined themselves quite closely to the actual forest border. I recorded none farther in the

forest than on the branches of the outermost trees nor farther into the fields beyond the fence than 40-50 feet. This species can thus be classified as a typical forest-edge bird.

Ruby-throated Hummingbird.—This species was observed in each woods studied, and its distribution, according to sex, was quite distinctive. In each area, a male was always observed along the forest border, and a female, with the exception of one occasion, in the forest interior. The sexes maintained separate territories and were not seen together until August 12, when three birds, a male, a female, and a third presumably a juvenile, were recorded on the forest border of Trelease Woods. Pitelka (1942:201) indicated the conspicuous independence of individual hummingbirds, the lack of relationship between the sexes, and the separate feeding territories which both sexes may maintain. In these Illinois woods the two sexes lived so definitely in different ecological communities that the male is considered as belonging to the forest edge and the female to the forest interior. In table 1, where birds are classified according to pairs that inhabit the forest edge or forest interior, the unusual sexual distribution of hummingbirds causes some totals to work out in fractions.

Crested Flycatcher and Wood Pewee.—These species are usually forest birds, although they are often found in open groves and not infrequently in towns. In these two woods they nested both in the interior and near the edge; the edges here are extremely narrow and in many places just twenty feet inside the border, forest conditions are, to all appearances, identical with those in the center of the woods. If no significant differences in environmental factors occur within the border, it would follow that the territories of interior species would often extend close to the edge. Although nests were not found, general observations led to the belief that both species nested at least 100 feet from the forest edge.

Both species, however, often used the edge for feeding. The Crested Flycatcher was found to be the most common bird on the border fences during the period of this study. Time after time it perched on a barbed wire, swooped over a daisy patch after insects, returned to the fence to eat them, and then repeated the performance. On one occasion a Crested Flycatcher was observed to feed, fly into the woods with insects in its mouth, reappear on the fence a short time later, and resume feeding. The Wood Pewee behaved similarly on numerous occasions.

It is logical that the birds feeding on the edge of the forest would seek food where it is most abundant. In these two woods the largest hordes of insects observed along the edge were clustered on or around the patches of daisies, asters, and wild carrots that stood between the fence and the forest trees. The nearest perch was the fence, and from it the Crested Flycatcher and Wood Pewee launched swooping flights at insects throughout the month of June. It is interesting to note that when later observations were made in August, the daisies, asters, and wild carrots had been succeeded by tall stands of giant ragweed and goldenrod, in some places taller than the fence. There was no fence-feeding at this date. The change in plant height, the passing of the nesting season, and the abundance of insects in higher strata may all have influenced the changed habit.

House Wren and Indigo Bunting.—Both of these species are usually considered forest-edge birds, but in this study they were found to occur uniformly (or almost so) throughout Brownfield and Trelease woods, as well as along the edge. Beginning with one pair at Trelease Woods in 1927, the House Wren has gradually invaded the area and has become more and more abundant until in 1942, 31 pairs were present, and in 1943, 40 pairs. The Indigo Bunting has been abundant in Trelease each year since 1927, but has occurred chiefly along the forest edge until the past few years, when it apparently invaded the interior in increasing numbers (Twomey, 1945; Kendeigh, 1944).

It seems probable that the habitat requirements of these two species could be met equally well inside a woods like Trelease Woods and around its border. Nesting sites, nesting material, singing posts, cover, and food are all available abundantly in both places. Yet similar conditions occur in many other forests, and such large numbers of House Wrens and Indigo Buntings do not occur there. The other species which occur in the interior of Trelease and Brownfield woods are true forest birds, by comparison with Turkey Run's large forested areas at least, belying the possibility of forest-edge conditions prevailing throughout the woods. Two considerations are advanced regarding this unusual habitat occurrence: (1) The occurrence in the forest interior of House Wrens and Indigo Buntings may be an example of Lack's (1933) "modification of a habitat preference": when more birds are present than their typical locally available habitat can accommodate they may become less restricted in the type of breeding ground which they select. (2) Kendeigh (1945) describes a similar changing behavior pattern in the process of evolution but not for reasons of lack of space. He indicates that every species has a definite behavior pattern which limits it to a particular niche in the community. He calls attention to the stereotyped behavior of the Magnolia Warbler (*Dendroica magnolia*) in building a nest which requires the interlocking leaves or twigs of a conifer to hold it in place; this behavior pattern appears to limit the species almost entirely to coniferous forests. In contrast, the Black-throated Green Warbler (*Dendroica virens*) appears locally to be breaking away from a nest-building behavior pattern similar to that of the Magnolia Warbler and to be acquiring the ability to build in semi-vertical forks, permitting it to inhabit deciduous forests. Perhaps a similar change, at present unknown, is taking place in the behavior patterns of the House Wren and Indigo Bunting, allowing them to invade a habitat formerly unoccupied by them.

DISCUSSION

A thorough survey of many types of edge is needed before the validity of forest edge as a community is established, but on the basis of this study and the related literature, I feel that the forest edge merits consideration as a distinct community. It has been shown that the forest edge is inhabited by a set of species different from that of the forest interior and that of the open field. As pointed out, there is some overlap, but among the three samples of edge compared in this study, two along a forest margin and one along a pastured creek, most of the species occurred in all three. Species which may be considered primarily forest-edge birds are the Field Sparrow, Mourning Dove, Cardinal, Goldfinch, Blue Jay, Robin, Yellow-billed Cuckoo, Indigo Bunting, Yellow-throat, Yellow-shafted Flicker, Red-headed Woodpecker, Crow, House Wren, Wood Pewee and Starling.

That certain species have made psychological adjustments to particular niches in the forest edge is further justification for the view proposed above. These adjustments take the form of specific behavior patterns (Lack, 1933, 1937; Moreau, 1935; Mayr, 1942; Miller, 1942; Kendeigh, 1945). One example, that of the Field Sparrow, has been discussed. Among others, the Yellow-throat uses the lower, outer part of the forest edge which borders and extends into the fields, whereas the Yellow-billed Cuckoo prefers that part which is the actual tree border and sometimes moves a short distance into the forest.

Finally, it may be observed that forest-edge communities provide light conditions somewhat intermediate between those of forest and field. There is greater freedom of movement along the edge than within the forest interior, but less freedom of movement than in the open field; physically, the edge habitat of grasses, shrubs and tree seedlings

is a step between forest and field. Walls (1942) was able to separate nocturnal and diurnal species according to the relative representation of rods and cones in the retina and thus to reveal an adaptation of the eye to light intensity. Perhaps a similar difference exists between forest and non-forest species. It is suggested that environmental relations such as these pertaining to light may be important factors in the relation which forest-edge species bear to neighboring, physically differing habitats.

SUMMARY

In a study of two central Illinois forests in the summer of 1943, fourteen species of birds were found to occur primarily along the forest edge and ten species in the forest interior. The Crested Flycatcher, Wood Pewee, Indigo Bunting, and House Wren were found in both habitats. Males of the Ruby-throated Hummingbird were forest-edge birds, the females forest-interior birds. The densities of the two forest-edge populations studied were 73 and 62.5 birds per mile, respectively; the densities of the forest-interior populations were 106 and 74 birds per 100 acres, respectively. The forest edge is considered to be a distinct community because it is inhabited by a characteristic set of species and because some, at least, of the birds which inhabit it display psychological adjustments to particular niches available only in the forest edge.

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BREEDING BEHAVIOR OF THE BLACK-HEADED GROSBEAK

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In this study of the breeding behavior of the Black-headed Grosbeak (*Pheucticus melanocephalus*), particular attention has been given to the role of the sexes at the nest. Observations were made in Strawberry Canyon, on the campus of the University of California at Berkeley, from April to September, 1945, and from April to June, 1946.

HABITAT

Strawberry Canyon cuts into the west slopes of the Berkeley Hills; it is about a mile long and one-third of a mile wide and ranges in altitude from 400 to about 1800 feet. The plant cover of the canyon consists of evergreen oak-laurel woodland chiefly on the lower slopes and along the small side draws, willows and alders along the creek, and chaparral and grassland on the higher and more exposed slopes. Here up to eight pairs of breeding grosbeaks occur within a half mile's distance in areas of favorable habitat along the canyon.

Grosbeaks may ordinarily be found in the woodland or in riparian groves and thickets: in these two major types of plant cover, the trees and marginal or understory bushes are used for almost all routine activities. In general grosbeaks are most often found in the open woods. The extensive peripheral foliage characteristic of open woods is advantageous to grosbeaks in foraging for food; for singing perches, grosbeaks appear to require fair visibility, and this feature is again best afforded by open woods. Nesting occurs most commonly in streamside bushes and trees and in the live oaks of open woods. Along edges or transitions between grassland and woodland or chaparral, grosbeaks are also common; but they enter chaparral and grassland only infrequently and then only in search of food.

SEASONAL OCCURRENCE

Occurrence of the Black-headed Grosbeak in the San Francisco Bay region is limited normally to the months between April and September, inclusive. Records for the years 1911 to 1946, based on field notes of several ornithologists, show that grosbeaks usually arrive at Berkeley in the first three weeks of April. The earliest recorded arrival date is April 4, the latest, April 21. According to my observations in 1945, female grosbeaks did not arrive on the breeding grounds in Strawberry Canyon until the sixth day after the arrival of the males. A careful search was made of the area each day and all individuals seen were recorded, as follows:

April 13, 1945, none present.	April 19, 1945, 7 a.m., three males, no females.
April 14, 1945, 0 a.m., one male, no females.	April 20, 1945, 7 a.m., three males, one female.
April 15, 1945, 1 p.m., two males, no females.	April 21 and 22, 1945, no counts made.
April 16, 1945, 7 a.m., three males, no females.	April 23, 1945, 7 a.m., three males, one female.
April 17, 1945, 7 a.m., two males, no females.	April 24, 1945, 7 a.m., three males, one female.
April 18, 1945, 7 a.m., three males, no females.	April 25, 1945, 7 a.m., four males, three females.

Fall departure is apparently irregular. Late in the season all individuals are quiet. The males cease singing after mid-July and are the first to leave, generally disappearing late in July. Females and young remain several weeks longer and usually begin to leave in mid-August. In the past thirty-two years, the last-seen dates at Berkeley have ranged from August 11 to October 9. Records after early September are probably those of transients rather than local residents.

There are a few records of winter occurrences: On November 20, 1938, E. R. Hall shot an adult male (M.V.Z. no. 74900) at Lafayette, Contra Costa County, California;

according to Hall (MS), this bird, or one indistinguishable from it, had been seen near his home almost daily for two weeks prior to time of collecting. H. W. Grinnell (1942) reported a dead grosbeak found in Berkeley on February 19, 1942; her report also contains two records of observations, February 16 or 17 and February 24, in the same year.

COURTSHIP AND TERRITORIAL BEHAVIOR

Courtship and selection of mates occurs after the grosbeaks arrive on their breeding grounds. The males arrive singly rather than in flocks and are solitary for the few days preceding arrival of females. They begin singing upon arrival, and their activities before the females appear consists largely of foraging in the live oaks and willows and uttering frequent songs from exposed perches. Males appeared to be spaced, but I saw no conflicts between them until after the arrival of females.

In 1945 lone females arrived six days after the males, and the grosbeaks engaged actively in courtship soon after. Two or even three males would be singing and flying about in the vicinity of one female, occasionally chasing her. Rival males also frequently chased one another.

The only type of display seen was a nuptial flight. Loud songs were uttered from some exposed perch near a female and then the male would suddenly fly up and out, performing a song-flight in the air above her. Flying forth on a horizontal course, the male would circle out from the summit of a tree, with wings and tail spread, uttering an almost continuous song. In the air for eight to ten seconds, he would then fly back, usually to the perch just vacated. I have never seen this display before a female coming more often than four minutes apart. Song-flights are not restricted to the courtship period but also occur, although less frequently, while the female is incubating.

Early in the season the males of the newly paired birds contend with unmated males. For instance, on April 25, 1945, I saw a male follow a female into a live oak; six seconds later a second male flew to the same tree and drove the first male off. Both male and female then flew off, returning five minutes later. This time, as the male perched at the apex of a live oak, the female gathered nesting material near by; they flew off together a few moments later. Again, on April 30, a male flew into an elderberry bush and drove a second male out; the pursued bird flew off, the second male following only twenty feet or so and then returning to the bush. No vocal sounds were uttered by either bird. Forty-five seconds passed and a female flew out of bushes fifteen feet away, carrying nesting material in her bill in the direction of a nest site; the male followed. Ten minutes later this male again chased another male from the trees in which the female had disappeared ten minutes before. The pair was occupied in this territory all morning, the male following the female about. On May 1, the male of this pair was again observed driving other males away.

During the early part of the season the paired birds forage together, and at this time the male is distinctly aggressive. On May 2, 1945, a lone male was foraging silently in a live oak. A female followed by a male suddenly flew to the same oak. Immediately upon arrival, the second male drove the first male away. The pair remaining then began foraging. The female searched for food almost continuously but the male spent most of his time peering around.

An instance of territorial competition apparently between established pairs was recorded on April 30, 1946, beginning at 10:33 a.m.: Two males and two females were observed fighting one another in the dense willow and thimbleberry thickets bordering Strawberry Creek. The entire ensuing action was restricted to the interior of the willow and thimbleberry thickets and followed an extremely irregular weaving course through

the branches and foliage. The activities of the four also were restricted to the vegetation immediately along a 100-foot section of the creek bed. No other species of birds were attracted by their activities. Clearly the birds were in pairs, one attempting to drive the other away. After a few moments of observation, it became evident that the females were the more aggressive, doing most of the fighting; they repeatedly postured and flew at each other, and at each attack, loud songs, calls and sounds of bodily contact could be heard. The calls and songs of both sexes made a loud chorus. The fighting between the two females seemed to disturb rather than incite the males, and they only added to the confusion by flying at the two females. In the twenty-two minutes I watched, the two males did not attempt seriously to fight each other; on several occasions, however, one would chase the other. In the remaining time, the males sang and called loudly as they nervously and rapidly hopped and flitted about near the females. The females repeatedly clashed, one flying at the other, both fighting and then one flying off, the other following. The males would follow on each such occasion. Yet every few minutes there were lulls in the activities of the four; no sounds were uttered and the four remained quietly on their respective perches or foraged. During one such lull, one of the females leaned forward on her perch, partly opened her wings, spread her tail slightly and opened her bill; she then rushed at the other female and struck her with her body, and immediately all four birds again began a varied chorus of songs and calls. The two females, when meeting in mid-air, slowly fluttered toward the ground, separating to fly up higher, only to clash again. In one of these encounters, four loud screech-like calls were uttered by one of the females apparently suffering pain. These screeches visibly disturbed both males, causing them to fly at the females who were locked in battle and to separate them. Three such bodily encounters occurred before the female on the defensive finally flew off, followed by the other female and both males at 10:55 a.m. One pair eventually disappeared upstream, the other moved downstream.

In this conflict between two pairs, it appeared significant that one female was obviously more aggressive than the other and that neither male actually entered into any offensive fights nor even paid very much attention to the other male. The conclusion that here one pair was encroaching upon the territory of the other was strengthened by the fact that about ten days later two nests were situated near the site of the conflict, about one hundred feet apart, the site of conflict being about half-way in between.

Another example of territorial encroachment was witnessed near Strawberry Pool on April 25, 1946. I heard two males singing about 50 yards apart. One, male A, took wing, singing as he approached male B. The latter drove male A away by flying at him, uttering a loud song as he did so, and pursuing him half-way back to male A's original post before turning back. Low *spic* calls could be heard from the mate of male B during this incident. Four minutes later, as male B was singing from an exposed perch in the live oaks, male A again flew across the pool, this time uttering no sounds; on this occasion, however, the intruder was not driven out and, in fact, no visible attention was paid to him by male B. A minute later, male A flew back across the pool, again singing loudly; as he disappeared, all of the birds became quiet. Subsequently, a female was seen carrying nesting material to the oaks where pair A was present earlier, and upon her arrival there a male uttered several calls. Several days later, a nest was found in this same group of oaks. I concluded, therefore, that the first time the intruding male had flown into these trees, the female had been at the nest site and the invader was driven off by her mate; he was probably not driven away the second time because the female was not at the nest.

Practically all local species of birds except predators and other grosbeaks are tolerated

at the nest. Wren-tits (*Chamaea fasciata*) were seen picking at one occupied nest, Bush-tits (*Psaltiriparus minimus*) were seen foraging on a nest, a Pileolated Warbler (*Wilsonia pusilla*) was seen standing on the rim of another nest, and none caused any apparent alarm on the part of the grosbeaks. But male grosbeaks generally did not allow other birds in the immediate vicinity of their singing perches. An exception to this was seen on April 30, 1945. At 7:42 a.m., I saw and heard a male grosbeak singing from a perch near the apex of a fir. Perched two feet above him was a male Purple Finch (*Carpodacus purpureus*), also singing. Both completely disregarded each other and at 7:44 a.m. the grosbeak flew off down the canyon and out of sight.

NESTS FOUND IN STRAWBERRY CANYON, 1945-1946

Nest 1-45.—The nest tree, a 15-foot coast live oak, and another oak of similar size ten feet up-slope, were situated in the center of an open, grass-covered clearing in a woodland, on a 25-degree southwest-facing slope, 125 feet upslope from a stream. The nest was 11½ feet above ground, resting three feet from the central axis in a three-way fork and concealed on all sides by clusters of leaves and twigs, as were all the remaining nests.

On May 3, 1945, the nest held four fresh eggs. Three eggs hatched before 8:30 a.m. on May 14; the fourth egg disappeared prior to May 14. Three young left the nest on May 26.

On August 30, this nest showed evidence of use by some small mammal. In the nest cup were 20 fecal pellets, several of them no more than 24 hours old. With these pellets were 14 small seed pods of several unidentified species of plants. A partial canopy of twigs and grass stems over the nest cup had been built. The size and shape of the fecal pellets closely resembled those of a white-footed mouse (*Peromyscus*). No further signs of activity were detected.

Nest 2-45.—The nest tree, a 32-foot coast live oak, was located in oak-laurel woodland on a 35-degree south-facing slope next to Strawberry Pool. The nest was 28 feet above ground and rested ten feet from the central axis in a two-way fork.

Nest material was carried into this tree on April 30. When first discovered on May 8, 1945, the nest contained three eggs. Several days later it was deserted, the eggs having been destroyed. Apparently the same pair started a second nesting (6-45) in a laurel 100 feet away.

Nest 2-45 consisted entirely of dry material from the following four herbaceous plants: *Convolvulus*, small stems with a total of six dry capsules attached; *Conium*, small stems; *Clematis*, small stems with attached tendrils and parts of three dry leaves; *Eriogonum*, fine stems.

Nest 3-45.—The nest tree, a 28-foot coast live oak, was located in oak-laurel woodland on a 30-degree south-facing slope next to Strawberry Creek. The nest was 25½ feet above ground, resting 15 feet from the central axis in a two-way fork.

On May 11, 1945, the nest contained three eggs. These hatched on May 19. All three young left the nest on May 31.

Nest 4-45.—The nesting site, a thicket of mixed deciduous shrubs about 40 feet in diameter, was situated on an open 25-degree south-facing slope adjacent to Strawberry Creek. The thicket consisted of hazel-nut, blackberry, thimbleberry and *Baccharis*, averaging six to eight feet in height and was surrounded by an open, live-oak woodland. The nest was seven feet above ground near the center of the thicket and rested on a cross of two branches.

On May 14, 1945, the nest contained three eggs. On May 23 one egg hatched; one infertile egg remained in the nest, but the other disappeared before departure of the lone nestling on June 4.

Nest 5-45.—The nest tree, a 27-foot coast live oak, was located on a 25-degree south-facing slope in a closed woods adjacent to Strawberry Creek. The nest was 18 feet above ground and rested nine feet from the central axis, astraddle a fork.

On May 17, 1945, the nest consisted of only a very thin network-like platform of plant stems, construction having just started. It was completed on May 19, and the first egg appeared on May 22. The set of three eggs was completed on May 24, but on May 26 the nest and eggs were deserted. Five days after the desertion took place, the eggs were found destroyed.

Nest 6-45.—The nest tree, a 45-foot California laurel, was situated on a level area of open woodland at the upper end of Strawberry Pool. The nest was 32½ feet above ground and rested 18 feet from the vertical axis at a three-way fork.

Nest material was carried into this tree on May 16. When found on May 21, the nest held two eggs, both of which hatched on May 31. One nestling fell out of the nest and was killed; the other left the nest on June 11. (See also nest 2-45.)

On September 12, I found that this nest was being used by a dusky-footed woodrat (*Neotoma fuscipes*) as a feeding station. On three horizontal limbs, one to four feet from the nest, I found woodrat fecal pellets and urine stains. At the nest were placed 10 twigs four to eight inches in length,

arranged in a manner suggesting the beginning of a cover over the nest. Each twig was clean-cut at each end. In the nest cup itself, I found one acorn (*Quercus agrifolia*) and three partly chewed green laurel fruits (*Umbellularia californica*). In addition, pieces of the exocarp of chewed bay fruit were scattered about in the nest. This evidence leads me to believe that the woodrat had been using the nest as a place of storage and feeding, while at the same time enlarging and covering it. Use of this nest ceased after September 12.

Nest 1-46.—The nest tree, a 20-foot coast live oak, was located on a 35-degree south-facing slope at the upper end of Strawberry Pool near the site of nest 6-45. The nest was 15 feet above ground, and rested ten feet from the central axis in a three-way fork.

On May 5, 1946, four fresh eggs were in the nest. On May 15 one of the eggs hatched and one had disappeared; on May 16 a second egg hatched. The remaining egg was not fertile. Both young left the nest on May 27.

Nest 2-46.—The nest tree, a 25-foot, old, sprawling coast live oak, was located on a 25-degree south-facing slope in open woodland 100 feet above Strawberry Creek. The nest was 18 feet above ground in the live oak, and rested in a three-way fork in a vertical secondary branch.

When found on May 19, 1946, the nest held three eggs, two of which hatched on May 29, the third on May 30. Two nestlings died, one ten days old, the other 11 days old. The third nestling left the nest on June 10.

NEST BUILDING

Nest site.—Nesting usually takes place in deciduous bushes and trees bordering streams. Nests are built also in bushes or trees away from stream courses in gardens, dense brushland, closed woods and parklands; but these occurrences form a small per-

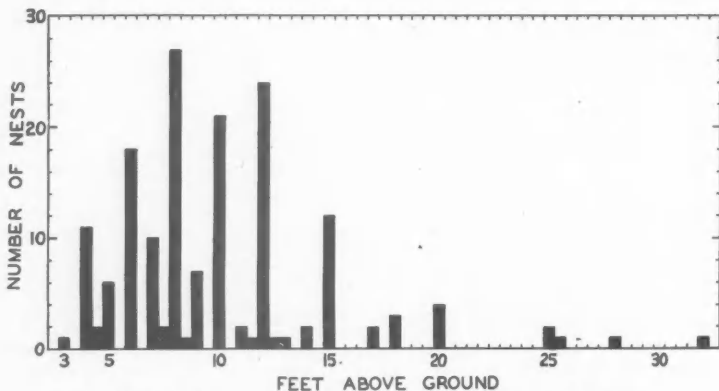


Fig. 10. Height above ground of 163 nests of the Black-headed Grosbeak.

centage of the total when compared with nestings near streams. Records of one hundred and twenty nests, from literature and specimens, show nests placed in twenty-nine different species of plants. Close to eighty per cent of the plants used were deciduous; willows were represented most frequently and constituted approximately thirty-five per cent of the total. Second in species representation, however, is the evergreen coast live oak (*Quercus agrifolia*), with twelve per cent of the total. Nevertheless, species of next-ranking frequency are all deciduous; these are, in order, alder (*Alnus rhombifolia*), big-leaf maple (*Acer macrophyllum*), blackberry (*Rubus vitifolius*), cottonwood (*Populus*), and elderberry (*Sambucus glauca*).

Nests are placed in trees and bushes, usually at a height of six to twelve feet above the ground. Among height records of 163 nests from various localities in California (see fig. 10), I found the average to be ten feet above ground. Seventy-eight, or 66 per cent, of these nests were placed between four and twelve feet above ground. The support for

the nest usually consists of a crotch or fork in a group of horizontal or vertical secondary branches. The location within the tree or bush varies; all eight nests studied in Strawberry Canyon were placed in the peripheral clusters of twigs or trees or bushes.

Table 1
Summary of Dimensions of Twenty-five Nests

	Outside depth	Inside depth	Outside diameter	Inside diameter
Maximum	10.0 cm.	5.5 cm.	17.0 cm.	9.5 cm.
Minimum	5.0	2.5	12.0	7.0
Average	6.7	4.1	13.8	8.1

Nest construction.—The nest is a bulky, loosely constructed affair, ordinarily composed of slender twigs, plant stems and rootlets, in the base and outer walls, and of finer stems and rootlets in the lining. Its shape varies from that of a saucer-like platform to one resembling a cup. Literature on this subject almost invariably mentions the flimsy construction of grosbeak nests; Grinnell and Storer (1924:487), for example, write that it "is so thin in weave that the contents can be seen at least in outline from beneath." This, however, was not true of any of the eight nests I studied in Strawberry Canyon.

Measurements of twenty-five nests from various localities in California are summarized in table 1. Dry weights of fifteen nests ranged from 12.7 to 27.5 grams and averaged 16.2 grams. Included in these fifteen are six nests collected in Strawberry Canyon in 1945; these varied in weight from 13.5 to 14.3 grams and averaged 13.9 grams.

Nests from Strawberry Canyon resembled each other not only in weight, but also in composition, size, shape, and color. This was undoubtedly due to the fact that nesting

Table 2
Nest-building Activity of Female at Nest 5-45

Date	May 17	May 17	May 18	May 19
Stage of construction	1st day	1st day	2nd day	3rd day
Time of day	6:39-7:30 a.m.	12:50-4:30 p.m.	7:29-11:45 a.m.	10:10 a.m.-12:15 p.m.
Total time	51 min.	3 hr. 40 min.	4 hr. 16 min.	2 hr. 5 min.
Weather	high fog	50% cloudy	50% cloudy	25% cloudy
ATTENTIVE PERIODS				
Total number	5 ¹	3 ²	32	8
Average time			50.4 sec.	34.9 sec.
Longest period			4 min. 2 sec.	65 sec.
Shortest period			12 sec.	18 sec.
Total time at nest	4 min. 54 sec.	101 sec.	27 min. 42 sec.	4 min. 39 sec.
Per cent total time	9.0	0.7	10.5	3.8
INATTENTIVE PERIODS				
Total number	4 ³	2 ⁴	31	7
Average time			7 min. 8 sec.	14 min.
Longest period			31 min. 10 sec.	26 min. 30 sec.
Shortest period			80 sec.	6 min. 21 sec.
Total time at nest	46 min.	3 hr. 38 min.	3 hr. 48 min.	2 hr.
Per cent total time	91.0	99.3	89.5	96.2

¹ 41, 43, 80, 62, 68 sec.

² 3½, 9½, 1½, 26½ min., also incomplete period of 4½ min.

³ 22, 34, 45 sec.

⁴ 6, 27¾ min.; also incomplete period of 2½ hr., 33 min.

materials available to the local population were similar. Presumably relative availability of various nesting materials at different nesting localities is responsible for the observed variations in weight as well as composition.

Building of the nest is done by the female. Suitable nesting material is normally sought within one or two hundred feet of the nest site and occasionally as far as 350

feet. The male usually follows her while she is gathering nesting material and he may accompany her to the general vicinity of the nest; however, I have never seen a male carry nesting material nor in any way aid in the actual construction of the nest. Finley (1907:46) mentions seeing a male grosbeak carrying a stick in his beak, but this is the only evidence known to me suggesting that the male may participate in nest-building.

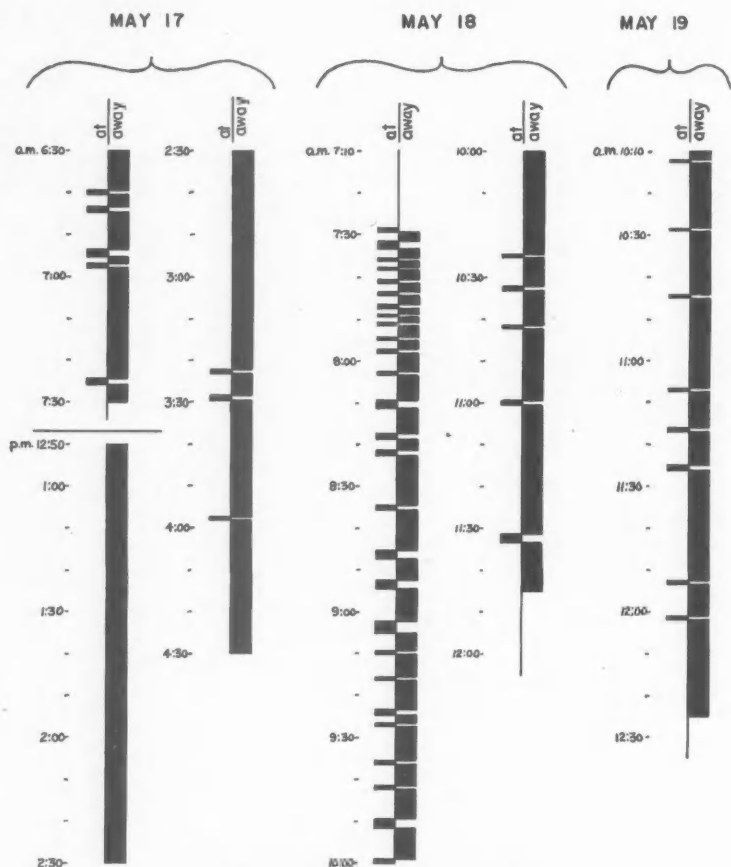


Fig. 11. Nest-building activity of female at nest 5-45.

Gathering of nest material in Strawberry Canyon was first observed in 1945 on April 25. On this occasion as well as on April 27 and 30 and May 16, the male of a pair was observed near or with a female searching for and collecting nest materials. On one occasion one male chased another from a spot where a female was gathering dry grass culms, the former male returning to a prominent perch after a short chase and following the female when she left. On May 17, a male remained fifteen to twenty feet

away from a female engaged in nest-building and uttered frequent songs of two-second to four-second duration at irregular few-second intervals as well as occasional *spic* notes; he followed her in several trips to and from the nest.

Construction of the nest takes from three to four days. Most of the building occurs in the mornings. Visits to the nest become less frequent and more irregular, as the day progresses, and in the afternoon the nest is visited occasionally without any nesting material. Close watch was kept on the construction of nest 5-45; my findings during this period have been summarized in table 2. In this instance, nest building occupied three days. During the last stages of construction, on the third day, the female spent noticeably little time in placing new material in the nest and, instead, spent most of her time readjusting material already there (fig. 11).

The male sang vigorously during the period of nest construction. Frequent call notes also were uttered. These songs and calls ordinarily came as the male waited while the female was gathering nesting material or was at the nest. In the afternoon of the first day of nest construction, however, the male did not attend the female on the female's first two trips to the nest (table 2). No song flights by the male were seen during the period of actual nest construction, but they did occur in the afternoons when nest construction ceased for periods up to two and one-half hours in length.

Periods spent at the nest by the female in actual construction work varied from 12 to 242 seconds in length, the average being 43. The number of visits apparently is greater in the mornings than later in the day (see table 2). Extremes of the inattentive periods away from the nest were from one minute to more than two and one-half hours. On a typical day of nest-building, the female spends about ten per cent of the time at the nest in the morning and less than one per cent of the time in the afternoon.

The amount of nesting material carried by the female on her trips to the nest varied from no material to three pieces, the usual number being one. Length of plant stems and twigs carried varied from five to thirty centimeters in length, the average being about twelve. The longer pieces went into the construction of the outer walls and the base of the nest, the shorter ones were placed into the more closely woven inner walls of the cup.

EGGS

The usual set of the Black-headed Grosbeak consists of three or four eggs. I have records of sets of two and five eggs, however; 192 sets average 3.31 eggs. Table 3 lists the distribution as to size of these sets. In Strawberry Canyon, I have found one set of two eggs, four sets of three and two sets of four.

Table 3
Number of Eggs in 192 Sets

Number of eggs per set	Number of sets	Per cent of total
2	18	9.5
3	96	50.0
4	75	38.9
5	3	1.6

My measurements of 207 eggs averaged 24.48×17.75 mm. If measurements from sets of comparable size from a total of 62 sets are averaged (table 4), it is found that the larger the size of the set, the smaller the eggs. The average egg of seven two-egg sets is 1.5 per cent longer and 2.4 per cent wider than the average egg of 32 three-egg sets. In turn, the average of these 32 three-egg sets is 1.7 per cent longer and 2.2 per cent wider than the average of 23 four-egg sets. No measurements from five-egg sets were available.

Nice (1937:114) found a parallel difference in comparing size of eggs with size of set in the Song Sparrow.

Grosbeaks normally lay only one clutch of eggs each season. No evidence of repetition of the nesting cycle, once it is completed, has been found either in the field or in

Table 4
Egg Size in Relation to Clutch Size

Size of sets	Total no. of sets	Length		Width	
		Average	Extremes	Average	Extremes
2	7	25.08 mm.	23.00-28.60 mm.	18.19 mm.	17.60-19.40 mm.
3	32	24.70	22.70-27.20	17.75	16.00-18.90
4	23	24.28	22.00-27.40	17.36	15.00-18.20

literature. If eggs or nestlings are lost, a second attempt at nesting frequently occurs. No records are available, however, of more than two attempts in a single season.

Following the completion of the nest there is a period of from two to three days before the female grosbeak begins to lay the eggs. The eggs, laid at intervals of approximately twenty-four hours until the set is complete, are, as near as I was able to determine, usually deposited before 7 a.m. Visits made to a nest at the end of the day would fail to disclose any change in nest contents, while a visit to the same nest at 7 o'clock the following morning would disclose an increase in the number of eggs present.

INCUBATION

Continuous incubation normally starts with the laying of the next-to-last egg of the set. At the nest the behavior of the male and female, who share the task of incubation, is similar. During this period the male does not feed the female and she consequently has to leave the nest to forage for food. During her absence from the nest, the male takes over the duties of incubation.

The female incubates the eggs at night. The first activities in the morning are songs by the male from his roosting perch. These songs come before sunrise and are among the first songs heard in the canyon in the morning. They seem to stimulate the female, as she will utter frequent loud *spic* call notes in response. From twenty minutes to a half hour after the first signs of activity, the male appears at the nest tree. As he appears, the female leaves the nest, pauses on a nearby perch to stretch for ten to fifteen seconds, and then disappears. After fifteen to twenty minutes the female returns to resume incubation.

During incubation the activities of the pair follow a set pattern so closely that they can be predicted with surprisingly great accuracy. As the day progresses, the periods of incubation lengthen; but toward the end of the day they tend to shorten, being similar in length to those of early morning. On an average day the eggs are incubated about 99 per cent of the time, about 40 per cent of the time by the male and 60 per cent by the female (table 5). The average length of each incubation period of the male is close to 20 minutes, of the female 25 to 30 minutes. Extremes in periods on the eggs are 6.3 minutes and 53.2 minutes; the former was by a male, the latter by a female. Their alternation of attentiveness at the nest goes on throughout the day.

An example of typical exchanges of incubating positions follows: On May 4, 1945, at 7:46 a.m., the male was incubating. A female flew into view and perched on a branch eight feet from the nest. At this perch, at nest level, she paused and uttered six loud single *spic* calls at two-second intervals. Between calls she wiped her bill from side to side on her perch. As if in answer to the calls from the female, the male uttered three songs each of two seconds' length at three-second intervals from his position on the eggs. He also uttered several *spic* calls. The female then flitted to a perch five feet from the nest. As she did so, the male, who had been raising himself off the eggs, watching her, hopped up to the rim of the nest and flew silently off out of sight. Eight seconds later the female flitted to the

Table 5
Attentiveness of Both Sexes at Nest 1-46

Date	May 5, 1946	May 7, 1946	May 9, 1946
Stage of incubation	4 days	6 days	8 days
Time of day	7:00-11:25 a.m.	6:00-12:00 a.m.	1:10-5:15 p.m.
Total time	4 hr. 25 min.	6 hr.	4 hr. 5 min.
Both sexes:			
ATTENTIVE PERIODS:			
Total number	8	17	9
Average time	29 min. 12 sec.	17 min. 36 sec.	25 min. 25 sec.
Longest period	53 min. 10 sec.	36 min. 46 sec.	46 min. 17 sec.
Shortest period	22 min. 36 sec.	6 min. 18 sec.	14 min. 25 sec.
Per cent total time	99.5	99.0	99.1
INATTENTIVE PERIODS:			
Total number	8	18	9
Average time	10.3 sec.	12.6 sec.	15.8 sec.
Longest period	12 sec.	40 sec.	34 sec.
Shortest period	6 sec.	6 sec.	8 sec.
Per cent total time	0.5	1.0	0.9
Male:			
ATTENTIVE PERIODS:			
Total number	4	9	5
Average time	24 min. 12 sec.	16 min. 42 sec.	20 min. 30 sec.
Longest period	26 min. 54 sec.	36 min. 46 sec.	28 min. 39 sec.
Shortest period	22 min. 36 sec.	6 min. 18 sec.	14 min. 25 sec.
Per cent total time	36.7	41.8	40.8
Female:			
ATTENTIVE PERIODS:			
Total number	4	8	4
Average time	35 min. 42 sec.	19 min. 35 sec.	30 min. 16 sec.
Longest period	53 min. 10 sec.	36 min. 7 sec.	46 min. 17 sec.
Shortest period	22 min. 48 sec.	6 min. 56 sec.	21 min. 12 sec.
Per cent total time	62.8	57.2	58.2
Total time			
eggs incubated	4 hr. 23.6 min.	5 hr. 56.2 min.	4 hr. 2.6 min.
Total time			
eggs unattended	1 min. 23 sec.	3 min. 48 sec.	2 min. 23 sec.

rim of the nest. Standing there, she peered around and down at the eggs for four more seconds, uttering two sharp *spic* calls as she did so. She then hopped down into the nest, spread out the feathers on her abdomen and settled down on the eggs. Then, after one more *spic* call, she became silent. As she incubated, she occasionally turned her head from side to side, usually in response to some noise or movement in the vicinity. At 8:12 a.m., the male appeared in a laurel downslope from the nest tree. There he uttered a three-second song. While he sang, the female uttered a single *spic* call from the nest. She then raised her body off the eggs, hopped to the rim of the nest and flew off on the opposite side of the nest from the male. Six seconds passed before the male flew to the rim of the nest. He uttered a two-second song while standing there, and then hopped down into the nest. Fluffing out his abdominal feathers and settling himself on the four eggs, he uttered a one-second song, then three seconds later another, after which he was quiet.

Weather conditions exert a marked influence on attentiveness: During cold, wet weather the periods are longer than those during warm clear weather. In four and one-half hours of one morning (table 5), the attentive periods of both sexes totaled eight. The eggs were covered 99.5 per cent of this time, the average length of each attentive period being 29.2 minutes. The eggs were left uncovered eight times, the average for each such occasion being ten seconds. During this same period the male incubated 36.7 per cent of the time, the female 62.8 per cent. A high fog was present all morning. In contrast, on a bright sunny day, during a six-hour period in the morning, the attentive

periods totaled 17. The eggs were covered 99 per cent of the time, the average of each attentive period being 17.6 minutes. The eggs were left uncovered 18 times, the average for each such occasion being 12 seconds. During this period the male incubated 41.8 per cent of the time, the female 57.2 per cent. The average time on the eggs for the male was 16.7 minutes, for the female 19.6 minutes.

The male occasionally sings while incubating. These songs, coming at irregular intervals, are generally about four seconds long. Their volume, although not so great as in the songs uttered while the male is away from the nest, is sufficient to carry several hundred feet. When searching for nests early in the season, I have used these songs from incubating males as a means of locating nests. The female also sings while incubating; her songs, however, come at infrequent, irregular intervals. Although the male sings while alone at the nest, the female usually sings only when the male is in the near vicinity. Her songs are faint, being audible only 50 feet or so from the nest. Both sexes frequently utter very faint songs when exchanging incubating positions. Almost whisper songs, these are audible only up to about 15 feet from the nest.

Call notes, which I describe as a sharp *spic*, are given frequently by both sexes, most often immediately before an exchange of incubating positions. Occasionally the incubating male will utter several of these notes, as if to notify its mate that it wants to leave the eggs. Several will be given in a series. If no answer is received, the bird will remain silent for 15 to 20 seconds and then utter another series of calls. I have seen the male utter several series while he was incubating, get no answer from the female each time, and then suddenly leave the eggs unattended. On each such occasion the female finally appeared and continued the incubation. Three minutes is the longest interval in which I have seen the eggs left unattended on such an occasion. The female also seems to express her desire to leave the eggs by calling to her mate, but I have never seen her leave before he appeared to take over the incubation duties. However, as a general rule, the incubating bird waits until its mate appears before calling, and then departs.

The eggs begin hatching on the twelfth day of incubation. In each of three nests containing three eggs each, the last egg hatched twenty-four hours after the others. In two of these cases, nests 3-45 and 2-46, the first two eggs hatched within a few hours of one another. In the third set, 1-46, one of the eggs, apparently infertile, did not hatch. In nest 6-45, holding two eggs, the eggs hatched within a few hours of one another. In nest 4-45, only one egg out of three hatched. Three of four eggs in nest 1-45 hatched within a few hours of one another, the fourth not hatching.

During the day previous to hatching a single hole is picked by the young near the region of the greatest diameter of the egg. At nest 2-45 I found the larger half of an egg shell fifty feet downslope from the nest tree. Apparently the parents carry the egg shells away from the nest and drop them; no other evidence of disposal of egg shells was obtained.

PARENTAL CARE

The change in the daily cycle of the adults with the hatching of the young is surprisingly small. Male and female cooperate in the care of the young, brooding and feeding them, attending to nest sanitation and acting in their defense.

The activities of a pair of grosbeaks for three hours on the first day of life of the young in the nest are summarized in table 6. They are also described in the following text. These activities show the behavior of the adults to be similar to that during incubation except that food is brought to the nest. The young are brooded continuously except during short intervals when the parents are exchanging positions on the nest.

After each feeding the young are brooded. Both calls and songs are uttered at and away from the nest by both sexes but not as often as during incubation.

Table 6
Feeding and Brooding Activities at Two Nests

Age of nestlings	1 day (May 14)	2 days (May 15)	7 days (May 20)	12 days (May 27)
Period of observation	3 hr., 8 min. (7:37-10:45 a.m.)	2 hr., 14 min. (7:16-9:30 a.m.)	12 hr. (6:00 a.m.-6:00 p.m.)	3 hr., 5 min. (8:10-11:15 a.m.)
Number of nestlings	3 (nest 1-45)	3 (nest 1-45)	3 (nest 1-45)	2 (nest 1-46)
Total visits	11 ¹	10 ¹	67 ²	14
Average number per hour	3.1	4.4	5.5	4.3
Extremes per hour	3 to 4	3 to 5	2 to 10	3 to 5
Intervals	10	9	65	12
Average length	18.5 sec.	1 min. 25 sec.	11 min.	12.3 min.
Total time at nest	3 hr. 4.9 min.	2 hr. 1.1 min.	5 hr. 55 min.	53.6 min.
Average time per visit	16.8 min.	12.1 min.	5.3 min.	3.8 min.
% time young attended	98.3	90.3	49.3	28.9
% time young brooded	96.8	80.8	45.9	26.9
% time young unattended	1.7	9.7	50.7	71.1
Visits to feed and brood	10	9	26	3
Visits to feed only	0	0	33	10
Visits to brood only	0	0	7	1
Male				
Total visits	5	5 ²	32	3
Average number per hour	1.6	2.2	2.6	1
Extremes per hour	1 to 2	2 to 3	0 to 5	1 to 2
Intervals	4	4	31	2
Average length	22.1 min.	17.9 min.	21.1 min.	52.5 min.
Total time at nest	1 hr. 42.2 min.	51.3 min.	1 hr. 9 min.	1.1 min.
Average time per visit	20.4 min.	10.2 min.	2.1 min.	12.5 sec.
Visits to feed and brood	5	5	7	0
Visits to feed only	0	0	25	3
Visits to brood only	0	0	0	0
Female				
Total visits	6 ¹	5 ²	35 ²	11
Average number per hour	2	2.2	2.9	3.3
Extremes per hour	1 to 2	2 to 3	2 to 5	3 to 4
Intervals	5	4	34	10
Average length	17.9 min.	14.1 min.	12.6 min.	12.8 min.
Total time at nest	1 hr. 39.3 min.	1 hr. 9.8 min.	4 hr. 29 min.	52.5 min.
Average time per visit	16.5 min.	13.9 min.	7.6 min.	5.2 min.
Visits to feed and brood	5	5	19	3
Visits to feed only	0	0	8	7
Visits to brood only	0	0	7	1

¹ Two periods incomplete.

² One period incomplete.

On May 14, 1945, at 7:37 a.m., as a light rain was falling, the female was brooding three young at nest 1-45. She remained quiet until 7:38, when the male flew to a perch two feet from the nest. Fifteen seconds later she stood up in the nest, backed off the young, and flew off down canyon. After four seconds the male flitted to the rim of the nest. After feeding the young in a slow deliberate manner, he settled down and covered them from the rain. At 7:53 the female returned and perched in a laurel 50 feet downslope from the nest. Perching there for 15 seconds, she wiped her bill back and forth several times on her perch and then flew to a perch one foot from the nest. Upon her silent arrival the male hopped to the opposite side of the nest, peered around for four seconds and then flew off. After four more seconds, the female hopped to the rim of the nest and fed the three young a total of seven times. After feeding, the female reached down, picked up a fecal sac with her bill, and swallowed it. Then she hopped into the nest and arranged herself on the young. At 8:16 a male grosbeak hidden from view in the nearby live oaks uttered several songs. The female on the nest uttered several *spic* call notes, as if in response to the songs, and then left the nest and flew down canyon. Fourteen seconds passed before the male flew into view and to the rim of the nest, where he fed the young. Twenty-four seconds after arriving he hopped down into the nest and continued the brooding. This feeding-brooding process was maintained during the entire three hours I was at the nest. On the morning of the second day, activities of the parents at the nest were similar to those of the first day (see table 6). Departure and return to the nest were deliberate. Songs and calls were uttered occasionally by both parents.

During the first four days, the young are fed a soft pale green mash (see Ivor, 1943). At each exchange of positions on the nest the parent bird brings food and slowly feeds the young, on the average of three to four times each hour (table 6). The bills of the adult and the nestling it feeds are held at right angles. The food is then placed well back in the mouth, the nestling swallowing it without closing its mouth. Toward the

end of the fourth day, such whole material as lepidopterous larvae is introduced into the diet of the young. The routine of feeding and brooding alternately by male and female during the first and second days of nest life is shown graphically in figure 12.

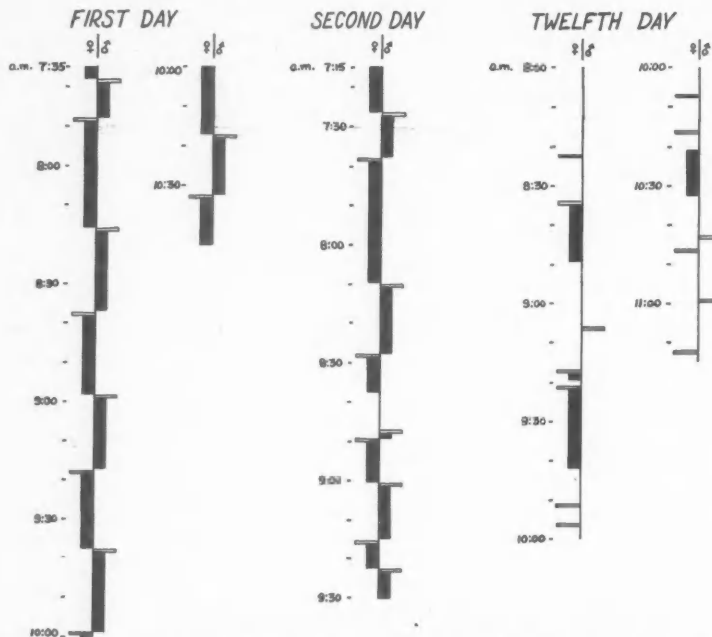


Fig. 12. Attentiveness at nest with young at three different ages. Open rectangles indicate parent feeding young; solid areas indicate brooding.

Although the young need more food as they grow, the number of trips to the nest with food by the parents is not increased; instead, the bulk of the food brought on each trip increases. The size of the brood exerts an influence on the amount of food brought and the number of trips made. Thus, at nest 4-45, daily weights were taken of a lone young and it was found, in comparing its growth with nestlings in broods of two or three, it weighed not quite a gram more than the others. Apparently it weighed slightly more because it received all the attention of both parents.

On the fifth and sixth days, when there are two or more young in the nest, each is fed one-third to one-half the total times the parents visit the nest with food. Generally one and sometimes two nestlings are fed on each visit. No rotation of feeding is evident, and usually the first bird to raise its head receives the food. Invariably all the young beg for food on each visit, by raising their heads, and those that do not receive food often hold their heads up several seconds longer than the one that is fed. At this age the young begin to call loudly and beg whenever one of the parents appears at the nest with food.

As the young develop, both parents spend progressively longer periods off the nest. By the seventh day (table 6) the parents brood much less constantly, although the

young are covered a good part of the time. The young still respond to calls and touches on the nest by raising their heads to beg food. The activities of the parents at nest 1-45 for an entire day are summarized in figure 13 and table 6.

On the eighth day the eyes of the young usually begin to open, and by the ninth day they are wide open; as a result the young are more active than before. At this

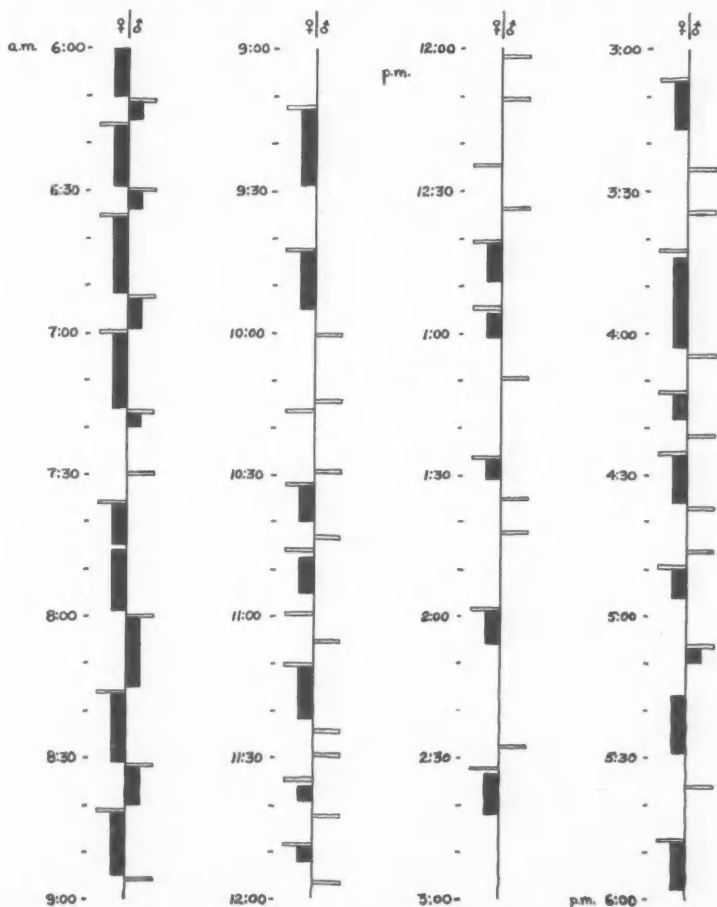


Fig. 13. Record of activities of parents at nest 1-45, on May 20, 1945, from 6 a.m. to 6 p.m. Young seven days old. Symbols as in figure 12.

time and in the following few days the weather is important in determining how attentive the parents are. On warm clear days the parents spend less time actually brooding the young than on cold wet days. For instance, late in the afternoon of May 25, 1945, I visited nest 1-46. It had been raining most of the day and was still raining as I reached

the nest. The female was brooding, sitting high in the nest, wings held partly open, helping to cover the two young. The female here was quite wet. I approached to within two feet of the nest before she would fly; then she did so with seemingly great reluctance, fluttering about nearby and uttering loud distress calls. In a few seconds, she was joined by the male. The young were perfectly dry, as was the cup of the nest, showing they had been covered effectively by the parents during most of the rain. As I left the nest tree with both young, she stopped calling and returned to the nest. First she ate one fecal sac that had been dropped there as I lifted the young from the nest and then she hopped down into the nest and spread her feathers out, showing no apparent concern at the absence of her young. The only object in the nest was one egg that had failed to hatch. When I returned the young to the nest, she went through similar actions and resumed brooding promptly after I left.

On the twelfth and last day at the nest the young are brooded only at infrequent intervals, depending on the weather. Activities of a pair of grosbeaks at nest 1-46 containing two nestlings twelve days old are shown in figure 12 and table 6. These data, together with the following discussion of the same nest, record typical activities on the last day of nest life.

On May 27, 1946, at 9:10 a.m., the two young at the nest were unattended. The weather was clear and warm, and the sun was shining into the nest. At 9:17 the female flew up to the nest and fed both of the nestlings. Ten seconds after her arrival she hopped into the nest and began brooding them. In doing so, she sat quite high in the nest, having a little trouble covering both young. She continued to brood the young quietly until 9:41, when she stood up in the nest and began uttering single *spic* calls at two-second intervals, peering from side to side as she did so. After twelve calls, she flew off. The male flew to the nest tree at 9:48 with several insects in his bill, but did not visit the nest. For a 40-second period he hopped and flitted about in the tree, uttering several *spic* calls before flying off.

At 9:43 the older nestling began to move about restlessly. It stood up in the nest, stretched both wings and flapped them several times. Then it began preening, picking first at its breast feathers and then at its wing feathers. Reaching under one of its wings, the nestling picked at the bases of several of the remiges and then ran its bill out the full length of one to the tip. Several times the nestling shook itself and once it toppled over as it stood in the center of the nest. Twice it hopped to the rim of the nest to peer about. After three minutes of such activity it quieted down, sinking out of sight into the nest cup. During this time, the younger nestling remained out of sight in the nest.

At 9:51 the female returned to the nest where both young were active and were begging for food. The older one hopped up to the edge of the nest and was fed six times, the younger one receiving none of the food. After being at the nest for 25 seconds the female flew away but returned again at 9:56. As before she was greeted at the rim of the nest by the older nestling, which again received all the food, being fed five times. In begging for food at this age, the nestling stretches its neck and head up, opens its mouth wide and shakes its wings with a kind of quivering motion. The female departed 25 seconds later and at 10:07 the male appeared. Once again the older nestling hopped up to the rim of the nest and received all of the food, even though the other one actively begged from the nest cup. Fifteen seconds later the male flew away and at 10:16 the female flew up to the nest, uttering no vocal sounds as she did so. Both young begged from the nest cup and this time the younger bird received all the food.

During the absence of the parents from the nest both young kept up a continuous chorus of faint *whee-urr* calls, each uttering a call about once every one to two seconds. With the appearance of one of the parents at the nest, both young would increase both the volume and number of calls as they begged. As soon as the parent left, the call would return to the original volume and number.

During the three-hour period that I watched this nest, the parents made 14 trips to the nest, ten by the female and three by the male (figure 12). The male did not brood the young at all and the female did so only four times. Three of the latter four times were to feed and then brood the young, while the remaining visit was made just to brood them.

At the time of feeding the young birds usually pass fecal material. Excreta, enclosed in mucous sacs, are normally eaten throughout the nestling stage by either parent; fecal sacs are eaten on the average of about 25 per cent of the visits to the nest, generally immediately following the feeding of the young. At nest 1-46 the young were

weighed daily, and when removed from the nest for weighing they usually defecated, leaving two fecal sacs in the nest. Each time the female returned to the nest, which held only one infertile egg and the fecal sacs, she proceeded to eat the sacs, gulping them down one at a time, and then hopped into the nest appearing as unconcerned as though the young were still there.

The activities of the parents and young for several days after the latter leave the nest are difficult to observe as all become quiet and extremely secretive in their movements. Late in the afternoon of the day after the young left nest 1-46, I returned to the nest site. The nest was unoccupied. In the trees about 50 feet down the slope I could hear faint *peé-urr* calls from a young bird. I answered, imitating the whistle-like call, and attracted the female, who came up within five feet of me. She did not utter a sound as she hopped and flitted about, watching me. As I moved downslope toward the sound of the calling young, the male suddenly flew up out of a 15-foot elderberry bush, uttering loud sharp *spic* notes. The hidden young promptly stopped calling. While I was searching the vegetation for the young, the female flew into the same bush and watched me, still not uttering any sounds. While I was at this bush, the male's calls increased in frequency, but when I moved away from the same bush, he quieted down. The fledgling was not located.

In the latter part of the season the young follow the females, the males having left soon after nesting is over. I have even seen females feeding well grown young as late as the early part of August, although I have no definite information on the actual length of the dependent period of the young after they leave the nest.

SONG AND CALL NOTES

Song of male grosbeaks resembles closely that of the Robin (*Turdus migratorius*); parts of the song are also reminiscent of that of the Western Tanager (*Piranga ludoviciana*). Length of individual songs varies considerably. The shortest that I have timed lasted one second, the longest eighteen; the average song is five seconds in length. The intervals between songs in a series vary from one second to twenty-seven seconds. In general, songs in the early morning are longer, louder, and richer in quality than those at other times during the day.

Male grosbeaks may sing more or less continuously up to twelve minutes or so at a time, but usually a series of songs lasts about five minutes. I have never heard males in series of songs during incubation or brooding that lasted over three minutes; at this time, songs usually consist only of short bursts lasting a few seconds each and marked by up and down twitchings of the tail, which projects up over the rim of the nest (see table 7).

The male sings on the wing during the period of courtship (see page 55) and occasionally during the nesting period as he moves from tree to tree. The latter flights follow a straight line and extend as far as three hundred feet.

Songs may be given repeatedly from a single prominent, elevated perch or as a momentary interruption while the bird is foraging. The male also utters single call-notes frequently while foraging. His songs and calls are quite loud when he forages alone, but when both sexes forage together, the songs are low and much softer.

In general, the songs of female grosbeaks are infrequent and never more than four seconds in duration and are never loud. They are uttered while the female is incubating or brooding, usually as the male comes to take his place on the eggs or young. Several times during nest-building, the female uttered songs in the vicinity of the nest and always in the presence of the male. The female will also occasionally sing while foraging

in the peripheral foliage of trees, but only when the male is close by. I have not heard female song after the nesting is completed, nor have I heard it before nesting begins.

During the early stages of nest life the vocal sounds of young consist of faint *peep* calls uttered when the parents are present or when the young are being handled. Toward the end of the nest life, the young develop a distinct soft musical *pee-urr'-rrr*, whistle-

Table 7
Records of Songs of Male Grosbeaks in Different Phases of the Breeding Cycle

	Before arrival of female	During courtship period	Near nest with eggs	While incubating
	9 ¹	9 ²	6 ³	5 ⁴
Number of observation periods				
Total observation time	34.7 min.	37.2 min.	14.6 min.	11.2 min.
Total number of songs recorded	182	283	78	136
Average length of songs	6.3 sec.	5.2 sec.	6.8 sec.	1.9 sec.
Longest song	18	17	18	5
Shortest song	1	1	2	1
Average length of intervals between songs	4.9	3.2	3.0	2.8
Longest interval	27	24	6	7
Shortest interval	1	1	1	1

¹ April 16-18, 1945, all between 7:27 and 8:39 a.m.

² April 19-30, 1945, all between 7:38 and 9:08 a.m.

³ May 3-5, 1945, all between 7:25 and 9:24 a.m.

⁴ May 3-5, 1945, all between 8:14 and 9:34 a.m.

like in quality. When the parents are absent, the young frequently stand up in the nest, peering around and calling intermittently. After leaving the nest, the young continue to give this hunger call. It also serves as a location call. Song of the young male was not heard; Wheelock (1904:256) states grosbeaks only eight weeks old utter a low warble.

The common call-note, a sharp *spic*, closely resembles that of the Rose-breasted Grosbeak (*Pheucticus ludovicianus*). It is commonly emitted while both sexes are foraging and at these times the calls are especially frequent, being repeated over and over at regular intervals. Its use at the nest has been described on page 62.

FOOD HABITS

Insects and other animal matter eaten by grosbeaks amount to more than the bulk of the vegetable food and should probably be regarded as their main food (Beal, 1904; McAtee, 1908). However, it should be kept in mind that perhaps this conclusion has been reached through analysis of stomach contents alone; in such a procedure, insect material is easier to find and identify than the vegetable material.

During their spring and summer residence in the San Francisco Bay region, Black-headed Grosbeaks forage predominantly in trees, feeding on fruits, buds and similar soft succulent vegetable matter. Their food additionally consists of arboreal insects. Grosbeaks may occasionally be seen flying out in midair in pursuit of insects. Grosbeaks may also frequent the ground in search of food; observations would indicate that the main items they seek on the ground are seeds and, to a lesser degree, insects.

In my field studies I noted a seasonal shift in food, probably due mainly to change in availability. For several weeks after their arrival on their summering grounds, grosbeaks fed mainly on such soft succulent vegetable matter as leaf buds, flowers and flower buds, as well as on early forming fruits. Worm-like larvae of various lepidopterous insects were also conspicuous in the diet at this time. As the weeks passed a slow change was discernible. With the maturing of other fruits, the grosbeaks resorted to them in

turn and fruit then became predominant in the diet. Early in the summer, with the disappearance of many of the fruits, the vegetable diet shifted to one consisting mainly of seeds, found in foraging about on the ground and in bushes. Except for the seasonal changes in the forms of lepidopterous insects and the accompanying change in diet, I noticed no appreciable shift in the animal diet of the adult birds.

A shift in animal diet of the young was noted. Early in life the young grosbeaks are fed only on soft animal matter such as caterpillars, but as they grow older, their diet becomes increasingly more like that of the adults. This change involves increased use of vegetable matter. There is also an increase in the hard elements of animal food, such as beetles and other harder insects, with a simultaneous decrease in caterpillars.

A high percentage of the grosbeaks' animal food in Strawberry Canyon is made up of the California oak moth (*Phryganidia californica*). This moth is known to attack coast live oaks (*Quercus agrifolia*) annually in the Berkeley area. During the spring of 1945 no oaks in Strawberry Canyon escaped defoliation except those along the roads, which had been sprayed with a solution of arsenate of lead. I frequently witnessed grosbeaks eating the worm-like larvae. On several occasions I saw pupa cases broken into, dropped and the pupae eaten. Innumerable winged adults were also captured and eaten, although the wings were dropped before the bodies were eaten. Of the three forms here discussed, however, the larvae were consumed most frequently, and these were the principal food of the young nestlings.

One other insect used for food in Strawberry Canyon was identified; on May 5, 1945, I found a partly eaten European earwig (*Forficula auricularia*) in the cup of a nest under the young birds. On several occasions I witnessed grosbeaks picking at oak galls and willow galls, apparently eating the insect larvae within.

In 1945, parts of eighteen different species of plants were used as food. For each species in the following list, parts eaten are stated together with the number of observations.

- Wild oat (*Avena fatua*), seeds taken twice.
- Black mustard (*Brassica nigra*), seeds taken three times.
- Thimbleberry (*Rubus parviflorus*), berries picked at once.
- Blackberry (*Rubus vitifolius*), berry picked at once.
- Wild rose (*Rosa gymnocarpa*), fruits picked at, flesh and seeds eaten once.
- Cotoneaster (*Cotoneaster orientalis*), parts of berries eaten once.
- Wild plum (*Prunus serrulata*), flesh of berries eaten three times.
- Locust (*Robinia pseudoacacia*), buds and flowers picked at and eaten once.
- Red-stem filaree (*Erodium cicutarium*), seeds taken once.
- Poison oak (*Rhus diversiloba*), fruit picked at once.
- Coffee berry (*Rhamnus californica*), flesh of berries eaten once.
- Cow parsnip (*Heracleum lanatum*), parts of green fruits eaten once.
- Amsinckia (*Amsinckia intermedia*), nutlets taken once.
- Elderberry (*Sambucus glauca*), flesh and seeds, but not skin, taken twice.
- Bristly ox-tongue (*Picris echioides*), seeds taken twice.
- Common sow-thistle (*Sonchus oleraceus*), seeds taken twice.
- Thistle (*Cirsium occidentale*), seeds taken twice.
- Yellow star-thistle (*Centaurea solstitialis*), seeds taken twice.

LONGEVITY

Cooke (1937:154; 1942:117) reports banding returns of grosbeaks as follows: 3, 3, 4, 4, 5, 5, 5, 5 years. Since some of these individuals were banded in mid-spring, it may be concluded that grosbeaks live at least six years in the wild. Linsdale (1943:14) writes that a grosbeak caught in 1918 died in February, 1943, after 25 years in captivity.

In addition there is in the Museum of Vertebrate Zoology a skeleton of a Black-headed Grosbeak that died in 1946 after 19 years in captivity.

SUMMARY

The Black-headed Grosbeak occurs in the San Francisco Bay region from April to September, inclusive. Here it breeds characteristically in oak-laurel woodland and in riparian groves and thickets.

Courtship and the selection of mates occurs after arrival on the breeding grounds; males, arriving singly, precede females by several days. The only type of display observed during the courtship period was a song-flight. Singing males occurred singly in areas of suitable breeding habitat. Active competition among males appeared to occur only in the presence of females. In one instance of conflict between established pairs, active fighting occurred between the females only.

Eight nests were studied in 1945 and 1946, in Strawberry Canyon, Alameda County, California. Nesting usually takes place in shrubbery and woodlands bordering streams; deciduous bushes and trees are the plants most frequently selected. Nests are usually placed at a height of from six to twelve feet above ground. The nest is bulky and loosely constructed and is ordinarily composed of twigs, plant stems, and rootlets; its shape varies from that of a saucer-like platform to one resembling a cup.

The female builds the nest in three to four days. Periods spent at nest building vary from 12 to 242 seconds, the average being 43. Material for the nest is gathered at varying distances from the nest, generally within one to two hundred feet of the nest. The male usually accompanies the female on these trips.

One egg per day is laid beginning the third day after completion of the nest. The usual number of eggs in a clutch is three or four. Continuous incubation normally begins with the laying of the next to last egg. Both sexes incubate. On an average day, eggs are covered about 99 per cent of the time, about 40 per cent by the male and 60 per cent by the female. During incubation, each attentive period of the male averages close to 20 minutes, that of the female 25 to 30 minutes. The female incubates at night. Incubation lasts 12 days; all eggs hatch within 24 hours.

Both sexes care for the young. During the first four days after hatching, young are fed with a soft mash. On the fourth day, whole material is introduced into the diet. Early in the nestling period, fecal sacs are eaten by either parent. As the young develop, both parents spend progressively longer periods off the nest. The nestling period is twelve days. After departure from the nest the young follow the female.

Black-headed Grosbeaks forage predominantly in trees, feeding on fruits, buds and similar soft succulent vegetable matter, as well as on insect life. During residence on the breeding grounds, buds, fruits, and seeds are eaten mainly in the order of their seasonal availability.

Male grosbeaks are in song upon their arrival in spring and continue to sing until mid-July. Both sexes sing while incubating eggs and brooding young. Both frequently utter low, short songs and calls while foraging for food. Males sing chiefly from some elevated perch; shortly after spring arrival and through the courtship period, they also sing on wing.

ACKNOWLEDGMENTS

Grateful acknowledgement is made to Dr. Alden H. Miller, who was helpful in guiding and counselling me in all phases of my work, and to Dr. Frank A. Pitelka for assistance in the preparation of this manuscript. Dr. Lincoln Constance kindly identified nest materials and plant foods. Elizabeth Evans aided in various phases of the field work and especially in the preparation of this manuscript.

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Museum of Vertebrate Zoology, Berkeley, California, February 1, 1947.

PROTOCOLLIPHORA LARVAE INFESTING NESTLING BIRDS OF PREY

By HAROLD M. HILL and TELFORD H. WORK

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During the past three years, in the course of field work with birds of prey in the San Francisco Bay area, two broods, one of the Sparrow Hawk (*Falco sparverius*) and one of the Golden Eagle (*Aquila chrysaetos*), were found infested in the ears and nostrils with blood-sucking larvae. On June 10, 1945, two Sparrow Hawks about ten days old were removed from their nest in a sycamore hollow in La Costa Valley, central Alameda County, and taken home to be raised for photographic purposes. There were two or three other young birds in the nest; one was dead, but unfortunately was not examined carefully. The day after removing the young hawks from their nest a black crust about the ear openings was noticed. When this had been removed, it became apparent that the ear canal was markedly swollen and filled with fat, squirming, grayish larvae. The right nostril and both ears of each bird contained larvae; none was found elsewhere. The nostrils were deformed, as the diameter of the larvae found there far exceeded the width of the normal nasal passages. Nine larvae were removed from one bird and 13 from the other. They varied from two to eight millimeters in length and usually contained a visible amount of the red blood on which they were feeding at the time of removal. The black crust about the ears was apparently from the excreta of the parasite, the dark color being due to the blood pigments which had passed through the larvae. It seemed to us that the two parasitized hawks were more restless and had larger appetites than two other normal Sparrow Hawks about the same age that we were keeping under observation at the same time.

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On April 10, 1946, we visited an eagle nest near Sunol in central Alameda County. Earlier in the season this nest had contained three eggs. On this day we found two chicks about three days old and one dead chick only partly out of the shell. When we returned ten days later, the ears of both of the eaglets were packed with blood-sucking larvae which appeared identical to those found in the Sparrow Hawks. The black crust about the ears stood out conspicuously against the white down, as shown in figure 14. Both birds appeared in good health. We returned the next day with forceps and removed most of the larvae; unfortunately the instruments were not small enough to reach as far down the ear canal as some of the larvae were and all were not removed. Unfortunately the larvae were lost. One month later, on May 21, we returned to the nest to band the young birds. At this time no larvae were found in the ears, and the birds appeared to be in good condition.

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In reviewing the literature on infestation of birds by *Protophthora*, it was found that numerous song birds, crows, and Mourning Doves were reported as hosts, but there was no mention of raptors. It is of interest that the nests reported in this note are but a few miles from Berkeley where O. E. Plath in 1917 worked out the life cycle of one species in this genus (*P. azurea*) in relation to its avian hosts. He reported that 39 of 63 nests of common song birds that he examined in the vicinity of Berkeley were infested (Condor, 21, 1919:30-39). It is not known whether the species of fly found in raptors are the same as those in song birds of this region, as none of the larvae was allowed to pupate and hatch out, and it is not possible to identify these species from the larval stage. The larval specimens obtained from Sparrow Hawks were identified as to genus through the courtesy of C. F. W. Muesebeck, Division of Insect Identification, U. S. Bureau of Entomology and Plant Quarantine. As was mentioned in Neff's recent paper on *Protophthora* infestation in Mourning Doves (Condor, 47, 1945:75), the blowfly family Calliphoridae is being revised by Dr. David G. Hall of the U. S. Bureau

of Entomology, and a new generic name is to be substituted for the American blowflies previously assigned to *Protocalliphora*.

In those *Protocalliphora* the habits of which have been studied, it has been found that the larvae feed for a relatively short time, in the case of the Mourning Dove (Neff, *op. cit.*:74) as little as 15 minutes, and then fall back into the nest where they remain



Fig. 14. Golden Eagle 13 days old showing enlarged and encrusted ear opening resulting from infestation by *Protocalliphora* larvae.

until hungry again. The usual place of attack is the feet, legs, or body, although Neff reported the larvae in the ears and nostrils of Mourning Doves. In the case of the young raptors reported here, the larvae were so densely packed in the ear canal, the relatively small opening of which was partly occluded by the hard dried excrement, that it appeared very unlikely that they crawled in and out frequently. Furthermore, the nostrils of the Sparrow Hawks were distorted and enlarged so as to just accommodate the one or two larvae present, indicating that they had been established there for some time. Thus, it appears that the habits of the raptorial parasites may be somewhat different from those previously studied. As the infestation is quite often fatal in the species of birds which have been investigated, it is not unlikely that the young Sparrow Hawk found dead in the nest had succumbed to the parasites.

Redlands, California, September 27, 1946.

WING ELEMENTS ASSIGNED TO CHENDYTES

By HILDEGARDE HOWARD

The continued recovery of leg bones of the large diving duck, *Chendytes lawi* Miller, in Pleistocene deposits of California, with no accompanying evidence of its wing bones, has been a matter of considerable interest to those of us working in avian paleontology. This peculiar overemphasis on the hind limb elements has naturally led to the suspicion that the bird had a degenerate type of wing, with bones either so fragile that they did not preserve well or so small as to be mistaken for other species of ducks.

In 1936 confirmation of this suspicion was suggested in the recovery of a fragment of an anseriform coracoid in the Del Rey Pleistocene deposit. This coracoid is about the size of that of a small scoter, but very much flattened and misshapen. The specimen is so fragmentary, however, that I did not consider it advisable to discuss its possible relationships when publishing upon the Del Rey avifauna (Howard, Condor, 38, 1936: 211-214).

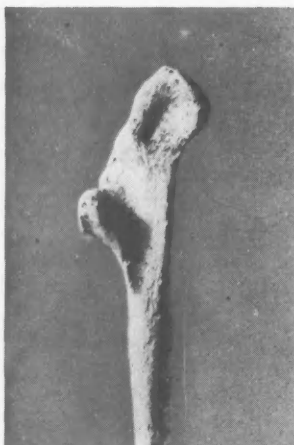


Fig. 15. Coracoid (L. A. Mus. no. 2042) from the Pleistocene near Newport Bay, Orange County, California, assigned to *Chendytes lawi*; $\times 2$.

Recently Mr. George Kanakoff of the Los Angeles Museum has recovered two unusual avian specimens from a Pleistocene deposit near Newport Bay. This deposit, which he visits weekly, has yielded a number of bird bones, and will be the subject of a more detailed paper in the near future. It should be stated here, however, that the collection from this locality includes a preponderance of *Chendytes* leg bones. The two remarkable specimens are a coracoid and humerus, obviously degenerate in nature.

The coracoid, which is intermediate in size between those of the White-winged and Surf scoters, has the unevenly contoured furcular facet characteristic of the diving ducks. The fossil bone, however, is markedly flattened and considerably distorted as

compared with the modern forms. Most interesting is the fact that it shows the same modifications exhibited by the fragment from Del Rey and is sufficiently well preserved to reveal the characteristics clearly. In a very general way the modifications parallel those found in the coracoid of the Flightless Cormorant (*Nannopterum harrisi*), although the fossil bones are much more flattened, both through the head and through the shaft. The furcular facet is rotated slightly inward and upward, the scapular facet projects away from the shaft, and the humeral facet is reduced in size. The great reduction of this latter facet in both the Newport Bay and the Del Rey coracoids is of especial import in connection with the finding of the humerus which I believe to be associated with the same bird.

The humerus is even more degenerate than the coracoid, and less well preserved. Both proximal and distal ends are badly eroded. The deltoid crest appears to be sufficiently intact to warrant the statement that it is nothing more than a slightly raised area slanting around to the center of the shaft on the palmar side. In the bicipital area, the furrow is well depressed and irregularly margined; the area of the crest is broken away. On the palmar side the pneumatic fossa is present but the breakage of the bicipital crest has destroyed its marginal contour. The palmar surface adjacent to the fossa is flat and smooth. At the distal end the impression of the brachialis anticus lies well toward the internal margin of the bone. In size this humerus approximates that of the Ruddy Duck (*Erismatura jamaicensis*), but no exact measurements can be taken except breadth and depth of shaft (4.0 and 3.4 mm., respectively).

Alone, the humerus probably could not be allocated. Taken with the coracoid, and associated in the deposit with several specimens of hind limb bones of *Chendytes*, I am convinced that the humerus, as well as the coracoid, may be assigned to that great diving bird. The proportions of both wing elements are smaller with respect to the leg bones of *Chendytes* than are the comparable proportions in *Nannopterum*. Moreover, the fossil bones are considerably more degenerate than those of the Flightless Cormorant. It appears now that the suspicions regarding the flightlessness of *Chendytes* are at last confirmed.

A complete survey of all avian specimens from the Pleistocene marine deposits of southern California is now under way, and it is possible that more evidence bearing upon this subject will be forthcoming as the material is reviewed.

Table 1
Measurements of Coracoid of *Chendytes lawi*

	L.A.M. no. 2042 from Newport	L.A.M. no. 984 from Del Rey
Distance: posterior rim of scapular facet to tip of head	14.7 mm.
Breadth of shaft between furcular and scapular facets	7.3
Breadth of furcular facet	6.7
Dorsoventral depth of head	3.4
Breadth of humeral facet	4.0	4.0 mm.
Length of humeral facet	8.1	7.6
Breadth of shaft below procoracoid	3.3	3.3
Depth of shaft below procoracoid	4.8	4.8

Los Angeles Museum, Los Angeles, California, November 14, 1946.

NOTES ON THE BIRDS OF THE DUTCH HARBOR AREA OF THE ALEUTIAN ISLANDS

By ALVIN R. CAHN

Dutch Harbor lies on tiny Amaknak Island within Captains Bay on the northeastern corner of Unalaska Island in the Aleutian chain. The entire island is under four miles in length. To the north it is open to the blasts and buffets of the Bering Sea, and on all other sides it is subjected to the gusty blasts of the "williwaws" that pile over the surrounding mountains and attack it from every direction at once. On all sides mountains shoot up from the sea to a height up to 5000 feet, with snow-capped tops even in summer. All shores are rough with wave-pounded rocks, and there are only few gravel beaches, and still fewer sand beaches. The entire area is treeless, except for two little clusters of spruces planted by the Russians around 1865; these have survived but never reproduced. It is a land of gales, fog, sleet, rain, snow and, on occasion, glorious sunshine and blue skies. The average winter temperature is around 32° above zero; the average summer temperature is 52°; the annual precipitation varies around 59 inches.

Prior to the war, the Aleutian Islands had been studied only spasmodically because of their isolation and uncongenial climatic conditions. During the war I served at Dutch Harbor for 47 consecutive months, which gave me an opportunity for more or less continuous ornithological observations. The following list is offered as a contribution to the ornithology of the Aleutian area.

Gavia immer. Common Loon. Not uncommon in winter in Captains and Makushin bays. One seen in Iliuliuk Bay on January 5, 1943; two near same place January 16, 1943; four in Makushin Bay on December 3, 1945. Latest date is March 3, 1946.

Gavia stellata. Red-throated Loon. Apparently about as common as the preceding species in winter, but also rarely present in summer. Seen on Unalaska Lake on June 6, 1944, and on Coxcomb Lake on May 8, 1946, both on Unalaska Island. Behavior of a pair seen at the mouth of Makushin Bay on June 10, 1945, suggested possible nesting.

Colymbus grisegena. Red-necked Grebe. Not uncommon in Captains Bay and Iliuliuk Bay in November, December and January.

Colymbus auritus. Horned Grebe. Seen sparingly in any of the bays during December and January, always solitary and rather shy. One was seen almost daily in Iliuliuk Bay during January, 1943. December 2, 1943, and February 21, 1946, are the extreme dates of record.

Diomedea nigripes. Black-footed Albatross. These birds follow ships from Seattle to the mouth of Unimak Pass and beyond into the Bering Sea, but only very seldom do they come within sight of Amaknak Island. In a big wind on November 19, 1942, two were blown into Captains Bay, but did not remain longer than was necessary. Ships in the Bering Sea repeatedly report these birds.

Fulmarus glacialis. Fulmar. In the late summer and winter these birds congregate in enormous flocks and are especially abundant about Unimak, Akutan, Unalga and Umnak passes. Thousands were seen in flocks at the north end of Akutan Pass on June 5, 1946. Nest abundantly on the cliffs in uninhabited and undisturbed cliff areas.

Puffinus tenuirostris. Slender-billed Shearwater. Common in very large flocks in Bering Sea during the summer months, but the species does not come inshore and hence is unrecorded from Amaknak Island itself. It seems to disappear about mid-August and to return sometime in May.

Oceanodroma furcata. Fork-tailed Petrel. Seen abundantly in the fall and winter far out in Bering Sea; apparently does not come inshore. On September 30, 1945, a female was brought in alive, having been picked up on the street in Dutch Harbor. It had a broken wing.

Phalacrocorax pelagicus. Pelagic Cormorant. Abundant everywhere along the rocky shores from September to May, when they desert inhabited areas completely to breed in less disturbed regions close by. Before Dutch Harbor became a Navy base, the birds bred commonly on Amaknak Island.

Phalacrocorax urile. Red-faced Cormorant. Much less common than the preceding species; seen during the fall and winter sparingly and in small groups, chiefly in Captains Bay.

Philacte canagica. Emperor Goose. Not uncommon locally in the winter and spring in all the larger bays. On April 2, 1944, a flock of 17 was seen near the mouth of Captains Bay, the birds resting on the shoreside rocks; they were very tame and permitted approach and study for half an hour from within fifty yards. On April 5, 1944, a flock of some 150 was seen deep in Captains Bay; on December 2, 1945, a flock of 16 flew low over Dutch Harbor and later that day a single bird was seen in Iliuliuk Bay. Makushin Bay and the rock-bound marshy country around it is an ideal refuge for the birds.

Anas platyrhynchos. Mallard. Common only in Makushin Valley during the winter, where the fresh-water swampy conditions provide a suitable habitat for the birds. A few remain into the summer and breed in this swamp; a flock of nine downy young accompanied by the female was seen in the mouth of the Makushin River on July 2, 1945.

Anas acuta. Pintail. Occasionally seen only during the fall migration in Makushin Valley; I saw one that was shot there on October 24, 1943.

Anas crecca. European Teal. Quite common only in Makushin Valley; present in the period from March to September and may breed here. One seen on October 14, 1943; two on December 2, 1943; two seen that had been shot on September 22, 1945.

Anas carolinensis. Green-winged Teal. Observed in every month of the year except August in four years of observations; inhabits the same area as *A. crecca*, but more common.

Nyroca marila. Greater Scaup Duck. An abundant winter inhabitant of all the larger bays, in common with the Harlequin Ducks and White-winged Scoters. The greatest numbers occur in December and January, and the species disappears entirely in April as a rule; May 3, 1946, is the latest recorded date. It returns again a few at a time, in September and October, gradually increasing in abundance.

Glaucionetta clangula. Common Golden-eye. Strictly a winter visitor, present in considerable numbers but never in large flocks. Golden-eyes drift in by one's and two's in late October (October 24, 1943) and are common in the larger bays during the period of December through February, at which time they disappear far more abruptly than they arrive. April 11, 1946, is the latest recorded date; this is unusually late.

Charitonetta albeola. Buffle-head Duck. On February 22, 1944, a single male of this species was observed flying over Dutch Harbor toward Makushin Bay. This is my only record.

Clangula hyemalis. Old-squaw Duck. Strictly a winter visitor but common in all of the larger bays, especially Captains Bay; usually seen in small flocks or solitarily. Earliest date of occurrence is November 3, 1943; the latest, April 19, 1946.

Histrionicus histrionicus. Harlequin Duck. These exquisite ducks leave the Dutch Harbor area in May and return, a few small flocks at a time, starting in mid-September. Three females, apparently stragglers, were present as late as June 29, 1946. During the winter the birds are abundant, occurring normally in small flocks of as many as a dozen birds; but toward spring they gather in larger flocks and leave. On June 14, 1946, in company with Dr. Ira Gabrielson, I saw several flocks of several hundred individuals each, deep in Captains Bay. The birds seem to segregate somewhat as to sex in flock formation. They are quick divers and I have frequently timed their submergence at 30 seconds and over.

Somateria mollissima. Pacific Eider. Not uncommon as a winter visitor from late November to early March. Never seen in large numbers, and females seem to predominate over males.

Somateria spectabilis. King Eider. Considerably more common than the last species; present from early December to early March, usually in small flocks of three to six, or solitarily. December 2, 1945, is the earliest record, April 3, 1944, the latest. The gizzard of a female found dead contained two specimens of the snail *Calliostoma*.

Melanitta fusca. White-winged Scoter. An abundant fall and winter visitor, especially from December to February. Often seen in Captains, Makushin and Summer bays in flocks of large size, and often associated with the Black Scoter.

Melanitta perspicillata. Surf Scoter. Apparently rare. I have but two records, both from Captains Bay: three on April 3, 1943, and a single individual on March 16, 1945.

Oidemia nigra. Black Scoter. Common in very large flocks in all the major bays from December to February, inclusive. During the winter gales they congregate on the leeward side of the islands

and ride the waves. Earliest date of arrival is November 28, 1942; latest spring record (possibly an injured bird), April 19, 1944.

Mergus serrator. Red-breasted Merganser. Common in Makushin and Captains bays during the late spring, summer and early fall. On July 4, 1945, I found a female with eleven downy young on Coxcomb Lake. On June 23, 1944, a female and nine young were found in the Makushin Valley swamp.

Aquila chrysaetos. Golden Eagle. While probably not rare in the higher and wilder parts of Unalaska Island, this species is uncommon around Dutch Harbor. Two records in four years: June 17, 1944, over Mt. Ballyhoo, and August 7, 1944, sitting atop a mast on a ship anchored at a dock.

Haliaeetus albicilla. Sea Eagle. Observed only on May 16, 1945, over Dutch Harbor and Mt. Ballyhoo. When first seen the bird was in low flight over a fresh-water lake on the island and was clearly observed for about 10 minutes as it circled over the lake; it then sailed slowly overhead toward Mt. Ballyhoo.

Haliaeetus leucocephalus. Bald Eagle. Very common; seen almost daily the year round, although less common in winter than in summer. In late April, a considerable flight of these eagles occurs; on April 12, 1944, 56 were seen over the island in two hours; on April 28, 1946, 27 were seen at one time over Dutch Harbor. Nests in the high, inaccessible cliffs of both Amaknak and Unalaska islands. Two pairs nested each summer on the northwest side of Mt. Ballyhoo. Young are out of the nest by early August.

Circus cyaneus. Marsh Hawk. There are but two records on hand of this species: a male on June 7, 1943, in Makushin swamp area, and a female on July 7, 1944, over the swamp around the Shaishnikof River at the end of Captains Bay.

Lagopus mutus. Rock Ptarmigan. Generally distributed among the mountains, but nowhere abundant. Ptarmigans nest rather high, and bring their young down to the lower slopes after hatching. On August 2, 1944, five young were found on Mt. Ballyhoo, but the species has been disturbed so much here that it has practically deserted the island. On November 19, 1945, two were seen on Ballyhoo at 1500 feet, in the intermediate plumage. On July 1, 1946, an individual was flushed from under foot on Ballyhoo at an elevation of less than 200 feet. Search revealed no young, but I suspect they were present.

Haematopus bachmanii. Black Oyster-catcher. Three birds were seen on the sand beach of Summer Bay on July 4, 1945; two were seen flying over the water in the same area on June 9, 1944, and one over the beach of Makushin Bay on June 14, 1943.

Arenaria interpres. Ruddy Turnstone. An individual of this species was seen on July 18, 1944, on the beach of Summer Bay, in company with numerous Rock Sandpipers.

Erolia ptilocnemis. Rock Sandpiper. Although seldom seen in numbers, this sandpiper is a regular and constant resident; I have at least one record for each month of the year except November. During most of the year the species is found along the rocky coast, but it nests above the rocky region in the dry grass well up from the shore.

Erolia minutilla. Least Sandpiper. On July 4, 1946, Dr. Gabrielson saw two and collected one along the river entering Nateekin Bay.

Limosa lapponica. Bar-tailed Godwit. On May 21, 1946, one was observed feeding on the sandy beach of Hog Island.

Lobipes lobatus. Northern Phalarope. Not recorded from the Dutch Harbor area, but large flocks were seen often in the Bering Sea between Amaknak Island and Unimak Pass. On May 28, 1945, one was brought to me by the captain of an incoming ship, the bird having flown into his searchlight on a very foggy night.

Stercorarius parasiticus. Parasitic Jaeger. Apparently a resident, but very seldom seen about Dutch Harbor. I have seen them on the cliffs in uninhabited sections of Unalaska, Unimak and Akutan islands. On September 15, 1944, two were seen over Captains Bay, and on June 4, 1945, one individual was seen in Nateekin Bay.

Larus hyperboreus. Glaucous Gull. Not common in the immediate vicinity of Dutch Harbor; in fact, birds in adult plumage are definitely rare. From April 1 to May 27, 1946, two immature birds were present at Dutch Harbor dock; these were pure white, with a black-tipped white bill and pinkish legs. Although there were hundreds of Glaucous-winged Gulls present, the two Glaucous Gulls did not associate with them.

Larus glaucescens. Glaucous-winged Gull. A resident species, extremely abundant except in the breeding season, when many individuals move to less populated areas; they do not breed about Amaknak Island. These gulls are practically domesticated; they feed out of the garbage cans, practically raid the galleys, roost on the door steps, and in general have about taken over Dutch Harbor.

Rissa tridactyla. Black-legged Kittiwake. This is a common species in the Eider Point-Cape Cheerful area of Unalaska Island, from which the birds range seaward. Observed on Amaknak Island only on September 28, 1945.

Uria lomvia. Northern Murre. A rare and solitary fall, winter and spring visitor, arriving in November and departing by early April for less disturbed areas. Often associated in Captains Bay with the Common Loon and Red-necked Grebe. They are not at all shy and are easily approached for study. Extreme dates are November 16 and April 22.

Cepphus columba. Pigeon Guillemot. A common resident species, but less numerous in summer, as the species nests only sparingly here. A few pairs breed on cliffs at the south end of Amaknak Island, and a few more on the east shore of Captains Bay.

Synthliboramphus antiquus. Ancient Murrelet. Not uncommon during the winter months, especially from January to early March, but present in numbers only off shore. On December 26, 1942, an oil-soaked specimen was picked up on the shore at Dutch Harbor. On March 4, 1945, I examined another specimen found in a local warehouse. Apparently does not breed near Dutch Harbor.

Cyclorhynchus psittacula. Paroquet Auklet. A single individual, brought to me alive, alighted on the deck of a vessel some 15 miles off Eider Point on March 3, 1945.

Aethia cristatella. Crested Auklet. Common in flocks off shore but rare at Dutch Harbor itself. On August 19, 1944, a male hit a local building and killed itself; on the morning of November 20, 1945, a bird was found sitting in the middle of Ballyhoo dock; on June 2, 1946, three were seen deep in Captains Bay.

Aethia pusilla. Least Auklet. Common at sea, but not found near Dutch Harbor. On May 16, 1946, a female in summer plumage which came aboard ship just off Eider Point was brought to me.

Fratercula corniculata. Horned Puffin. Extremely abundant in summer, but only in the larger, rock-bound bays. May 5, 1946, is the earliest recorded date, September 2, 1944, the latest. Puffins have continued to breed, although not abundantly, on the rock faces of Unalaska Island, even in the vicinity of troop activity; their nests are quite inaccessible.

Lunda cirrhata. Tufted Puffin. Much less abundant than the Horned Puffin; occur only at sea and in considerable numbers. Flocks of considerable size seen about Cape Cheerful, west of Eider Point, on May 16, 1945, and northeast of Priest Rock on June 23, 1945.

Nyctea scandiaca. Snowy Owl. Rare on Unalaska Island, but present in the uninhabited and rugged interior. On January 22, 1943, I saw a male that had been shot near Pyramid Mountain; on February 5, 1945, I saw another male shot near Unalaska village. During the war, men stationed on Bogoslof Island, 40 miles northwest of Dutch Harbor in the Bering Sea, shot three during the winter of 1943.

Asio flammeus. Short-eared Owl. On August 14, 1943, I flushed one from the tundra behind the village of Unalaska, and on August 1, 1944, I surprised another near Summer Bay.

Megaceryle alcyon. Belted Kingfisher. I have three records for this species, all in the area of Captains Bay: on August 17, 1943, a male and female were seen flying over the tip of that bay; on August 21 a single individual was seen near the village of Unalaska; and on July 27, 1944, a male was seen and heard near the mouth of the Shaishnikof River.

Corvus corax. Holarctic Raven. Extremely abundant everywhere at all times; breeds commonly on the slopes and cliffs of Ballyhoo. Like the Glaucous-winged Gulls, the ravens have foregone their natural food for locally available garbage, and as a result, are tame. Twice I have watched a raven kill a rat; the second time a young Bald Eagle was also watching, and when the rat was dead, the eagle took it away from the raven without argument.

Cinclus mexicanus. American Dipper. Observed only on the rocky bed of the swift Shaishnikof River entering the tip of Captains Bay. Here an individual usually can be found almost any time from mid-April to September; on June 12, 1946, three individuals were seen at one time.

Troglodytes troglodytes. Winter Wren. Found only among the rocky boulders along the shore. One gets, at best, but rare glimpses of this shy and secretive species; records extend from April 15 (1945) to September 3 (1943).

Anthus spinoletta. Water Pipit. A common summer resident, especially on wet swampy areas, but by no means confined to them; almost equally common on high mountains. Pipits arrive in early May (earliest date, May 3, 1944), and remain until mid-September.

Leucosticte tephrocotis. Rosy Finch. A common resident, becoming abundant from May to September and especially so about inhabited areas where they are tame. Rosy Finches normally nest in

tundra grasses, but one unusual nest with four well grown young was found on June 18, 1946, placed on the ledge of a window of a warehouse.

Passerculus sandwichensis. Savannah Sparrow. Apparently arrives in numbers almost overnight; by late May (earliest date, May 20, 1943) or early June they are suddenly everywhere among the tundra grasses, and in full song at once. During June, July and August they are extremely abundant and nest in the open tundra.

Passerella iliaca. Fox Sparrow. One was seen on June 5, 1944, at the foot of Mt. Ballyhoo.

Melospiza melodia. Song Sparrow. The large Aleutian race of Song Sparrow is a conspicuous inhabitant of the rocky sea shore and grassy areas above the sea. I have numerous records between April 7 (1945) and September 22 (1945) but no winter records. The species nests here in grass in open places; young appear out of the nest by early July. Possible second nesting is suggested by a nest with newly hatched young found on August 8, 1945.

Calcarius lapponicus. Alaskan Longspur. Abundant from May to September; extreme dates of occurrence are May 8, 1945, and September 23, 1943. Found from sea-level to the tops of the mountains. Young out of the nest were observed on June 24, 1946.

Plectrophenax nivalis. Snow Bunting. A regular, but never abundant winter visitor. The species was particularly numerous from January to March, 1943, in flocks of as many as 35 individuals. In 1945, there were many flocks on Amaknak Island between March 3 and 8. In the winter of 1942, I saw none. A male in full summer plumage was seen at 1100 feet on Mt. Ballyhoo on June 30, 1946; another and possibly the same one was seen on July 3.

Dutch Harbor, Alaska, July 2, 1946.

FROM FIELD AND STUDY

Mountain Chickadees Feeding Young Williamson Sapsuckers.—On June 28, 1946, while collecting in the Sweetwater Mountains, Mono County, California, an unusual life-history observation was made. In Sweetwater Canyon at 8000 feet, I heard the constant buzzing of young birds in the distance. As I approached a large white-barked pine (*Pinus albicaulis*) two Mountain Chickadees (*Parus gambeli*) left the vicinity of a hole in the trunk. As I stood marveling at the fact that young chickadees could be heard at approximately 100 yards, a female Williamson Sapsucker (*Sphyrapicus thyroideus*) came to the tree and proceeded to feed young birds through an opening 90° around the trunk and slightly below the hole I had been watching. It thus appeared that there were two families in close proximity. But then the male sapsucker arrived and fed young, not through the hole the female had just left but through the one the chickadees had been near. Observations were becoming more confusing by the minute. Watching the tree for the next half hour, I noted that every three to five minutes either two chickadees, or a male or a female sapsucker arrived to feed young sapsuckers. The adults and young used both openings indiscriminately. The chickadees came simultaneously, but the sapsuckers alternated in time of arrival. The chickadees' instinct to feed was being sorely tried by the violent reactions of the adopted brood. When one inserted its head in an opening, a charge by the inmates was too much to face, and the chickadee would fly to a branch nearby and then return immediately. This was usually repeated two or three times before the food was delivered.

When taken, the chickadees were carrying insect larvae one-half inch long, and the male sapsucker was providing the usual diet of ants.

Upon returning the following day to chop out the nest, I took the female sapsucker, and it, too, was carrying ants. At the first blow of the ax, two young sapsuckers popped out and flew down canyon. One was a male but the sex of the other could not be determined. The three remaining birds proved to be two females and one male.

Exposure of the interior showed how this family mixup could have occurred. An outer shell of the tree one and one-half inches thick was alive, but the center was rotten and the thin partition between the two cavities had broken away. Cavity 1 (see fig. 16) was bare, since any debris deposited here would be pushed down by the scrambling young. At the bottom of cavity 2 there was one sapsucker egg. This egg, stained brown, had a small hole in one side and was filled with dead ants. A mass of shredded bark and dead ants filled the cavity two-thirds full. Chickadees usually obtain fur for an inner lining, but this was not present. From the evidence, one might assume that the sapsuckers nested first in cavity 2, laying six eggs. Some time after five of the eggs hatched, the chickadees probably began to deposit an outer lining of shredded bark in cavity 1. The increasing activity of the young sapsuckers may have caused the partition to fall out, and the unusual adoption resulted.—WARD C. RUSSELL, *Museum of Vertebrate Zoology, Berkeley, California, January 16, 1947.*

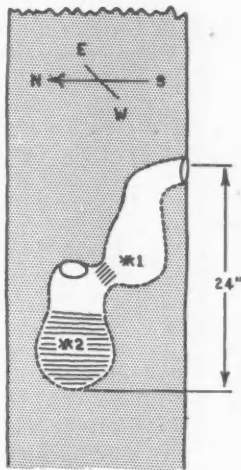


Fig. 16. Diagram of nesting cavities occupied by young sapsuckers.

Red-tailed Hawk Feeding on Coot.—While patrolling near El Padre Island, lower Millerton Lake, Fresno County, California, at 12 noon on November 20, 1946, my attention was attracted by a medium-sized, long-tailed hawk (possibly a female Cooper Hawk, *Accipiter cooperii*) which was diving from elevations of approximately 100 feet at a larger bird which was on the ground. Four such dives were seen before the bird retreated at my approach. Each time the hawk dived, the grounded bird would flutter as though attempting to fly.

As I drew close to shore, I saw that the bird on the ground was a large Red-tailed Hawk (*Buteo jamaicensis*). Its seeming reluctance to fly caused me to believe that it was injured, but as my boat touched shore, the hawk took off, carrying a large object approximately 20 feet before dropping it and flying to a stump some 200 feet distant, where it landed. It remained on this stump some 30 seconds before flying away.

Upon investigation I found that the object dropped by the Red-tailed Hawk was a full-grown Coot (*Fulica americana*). The entire head and neck were missing, and the upper breast had been torn open. The fresh condition of the Coot suggested that it had just been killed. A flock of more than 100 Coots had been swimming nearby and had flown up from the water as I approached shore. No evidence was obtained which would show precisely the relationship of one hawk to the other, or of either hawk to the Coot.—DOUGLASS H. HUBBARD, *National Park Service, Friant, California, November 27, 1946.*

Food Items from Red-tailed Hawk and Marsh Hawk Nests.—Pellets taken on July 12, 1939, from the nest of a Marsh Hawk in a *Salicornia* marsh about five miles southwest of Watsonville, Santa Cruz County, California, contained the following: Insects: 8 Jerusalem crickets (*Stenopelmatus* sp.). Birds: 1 Ruddy Duck (*Erismatura jamaicensis*), 1 Virginia Rail (*Rallus limicola*); 1 Pipit (*Anthus spinoletta*); 1 Brewer Blackbird (*Euphagus cyanocephalus*); 1 House Finch (*Carpodacus mexicanus*). Mammals: 3 meadow mice (*Microtus californicus*); 3 harvest mice (*Reithrodontomys longicaudus*).

From under a Red-tailed Hawk's nest in a eucalyptus about 5 miles northwest of Watsonville, there were taken on the same date pellets representing: Reptiles: 1 alligator lizard (*Gerrhonotus coerules*); 3 gopher snakes (*Pituophis catenifer*). Birds: 1 Spotted Towhee (*Pipilo maculatus*); 1 House Finch (*Carpodacus mexicanus*); 1 small bird, also probably a House Finch. Mammals: 4 California ground squirrels (*Citellus beecheyi*); 1 pocket gopher (*Thomomys bottae*); 1 meadow mouse (*Microtus californicus*); 1 brown rat (*Rattus norvegicus*); 2 rabbits (both apparently *Sylvilagus bachmani*).—R. M. BOND, *Soil Conservation Service, Portland, Oregon, November 11, 1946.*

The Cardinal of Central Baja California.—In the preparation of manuscript on the distribution of birds in Baja California it has been necessary to review the taxonomic status of races proposed since the appearance of Grinnell's "Distributional Summation" in 1928 and to revise the ranges of others for which very few data were then available. This is particularly true of the central part of the peninsula, most of which was but poorly known from an ornithological standpoint twenty years ago.

The Cardinal, *Richmondia cardinalis seftoni*, was proposed by Laurence M. Huey (Trans. San Diego Soc. Nat. Hist., 9, 1940:216) on the basis of three males taken at Santa Gertrudis Mission. Twenty specimens (twelve males and eight females) of this form have now been examined, and they amply confirm the validity of the race, although the set of characters which distinguish it from *Richmondia cardinalis ignea* of the Cape region must be revised. *Seftoni* is not intermediate in wing and tail length between *ignea* and *superba* of southern Arizona as may be seen from the averages of 24 male *ignea* (wing, 92.3; tail, 107 mm.) from the Cape region and 12 *seftoni* (wing, 92.4; tail, 103.6). The bill of *seftoni* is smaller in all dimensions than that of *ignea* or *superba*, as stated in the original description. The color of both sexes of *seftoni* is paler as compared with *ignea*, the crests of the males remarkably so, and the females are more ashy (less buffy) gray dorsally as well as paler generally. It may be remarked that *seftoni* bears close resemblance in color to *Richmondia cardinalis townsendi* of Tiburón Island, but the pallid crest of the former is a good distinguishing mark, and there are some size and proportional differences which need not be elaborated here.

The ranges of the two races of the Cardinal which occur in Baja California are as follows on the basis of information available at this time:

Richmondia cardinalis ignea (Baird); Southern portion of the peninsula of Baja California, north to the vicinity of Comondú and to the south end of Concepción Bay at about latitude 26° 30' N.

Richmondia cardinalis seftoni Huey; Central Baja California from San Lucas, latitude 27° 14' N north at least to Santa Teresa Bay at latitude 28° 22' N.

Specimens have been examined as follows: *R. c. ignea*, Cape San Lucas, 5; San José del Cabo, 17; La Paz, 8; Dolores Bay, 1; Los Frailes, 2; Agua Caliente, 5; Todos Santos, 2; Eureka, 1; Boca de San José, 1; Matancita, 1; El Médano, 1; South end of Concepción Bay, 2; Comondú, 4; [San José Island, 2; Carmen Island, 3: subsp. indet.]; total, 56. *R. c. seftoni*, San Lucas (27° 14'), 5, intermediate; San Ignacio, 6; 2 miles south of Santa Rosalia, 1; 11 miles west of Santa Rosalia, 2; 5 miles southwest of San Ignacio, 1; Santa Teresa Bay (28° 22' N), 1; Santa Gertrudis Mission, 3; total, 20.

I acknowledge gratefully the use of the collections at the Museum of Vertebrate Zoology, the San Diego Natural History Museum, and the collections of Laurence M. Huey and Max M. Peet.—A. J. VAN ROSSEM, *Dickey Collections, University of California, Los Angeles, September 30, 1946.*

Food of White-tailed Kites on the Suisun Marsh.—During May and June, 1937, Mr. J. D. Graham and I, while traveling about the Suisun Marsh, Solano County, California, noted that one

or both of a certain pair of White-tailed Kites (*Elanus leucurus*) would be found perched on a bare limb of a lone eucalyptus tree near the Grizzly Island Ferry landing. On July 5, 1937, I picked up twenty-nine fresh pellets from the ground under this favored perch and sent them to the Biological Survey for examination.

Due to moving and war activities, report was not made until September 25, 1946, under which date Mr. A. L. Nelson of the Division of Wildlife Research reported the result of the examination. All twenty-nine pellets contained remains of *Microtus*. Thirteen pellets each consisted of remains of one of these mice, fourteen the remains of two, one contained parts of three, and one pellet contained parts, in addition to *Microtus*, of one harvest mouse (*Reithrodontomys* sp.) and one house mouse (*Mus musculus*).

This report indicates that *Microtus* is the chief food of the White-tailed Kite on the Suisun marshes, Solano County, as has been found by Bond (Condor, 42, 1940:168) in Ventura County and by Hawbecker (Condor, 42, 1940:106; 44, 1942:267) in Santa Cruz County.—EMERSON A. STONER, Benicia, California, November 20, 1946.

The Hammond Flycatcher in the Willamette Valley, Oregon.—While identifying some birds from the Warner and Cooke collection taken in the Willamette Valley over fifty years ago, I found an adult male Hammond Flycatcher (*Empidonax hammondi*) bearing the label "Warner and Cooke—Clinton T. Cooke, 1342—Salem, Marion County, Oregon, April 28, 1891." So far as known this is the first and only known specimen of this flycatcher collected west of the Cascade Mountains in Oregon. It also constitutes the earliest spring arrival of *hammondi* in the state. Our earliest previous spring date of arrival as published in the "Birds of Oregon" (1940:396) was a specimen collected in Baker County in the northeastern part of the state on May 8.—STANLEY G. JEWETT, Portland, Oregon, July 8, 1946.

Notes from Death Valley, California.—On January 3 and 4, 1947, my father, L. P. Bolander, Edwin H. McClintock and I were in Death Valley, California. Among the twenty-five species of birds noted, there were four of more than passing interest.

Harris Sparrows (*Zonotrichia querula*) were first recorded in the valley by the late M. F. Gilman on November 10, 1936 (Condor, 39, 1937:90). At the time of our visit this species was present on and about Furnace Creek Ranch in sufficient numbers to be classed as common. At least fifteen individuals were seen at close range and no doubt there were others that escaped our attention. Each of us had excellent views of the birds and noted that all were seemingly immature. Only two were seen that closely approached the full adult pattern.

Starlings (*Sturnus vulgaris*) were twice seen by McClintock and myself on January 3 at the Furnace Creek Ranch. Two were first seen feeding with a group of Western Meadowlarks until a Cooper Hawk routed the gathering. Later a flock of eleven was seen just as dusk was descending. They flew over on a northward course, but we were not successful in our attempt to locate their roosting spot.

The Wilson Snipe (*Capella delicata*) and the Virginia Rail (*Rallus limicola*) were noted. These two water-loving species certainly seemed out of place in the barren surroundings even though they occurred along the irrigation ditches of the ranch.—GORDON L. BOLANDER, San Francisco, California, January 15, 1947.

New Records for the Boulder Dam Area, Nevada.—In the past few months three additional records have been added to the National Park Service check-list of birds of the Boulder Dam Recreational Area.

On September 2, 1946, a Frigate-bird (*Fregata magnificens*) was noted in the vicinity of Eldorado Canyon on the Colorado River about thirty-five miles below Boulder Dam. This is, so far as is known, the first record of this bird from southern Nevada.

During the latter part of September a Brown Pelican (*Pelecanus occidentalis*) was observed on the shore of Lake Mead near the Boulder boat dock in company with a dozen or more White Pelicans (*Pelecanus erythrorhynchos*). These birds remained in the vicinity for several days before winging off to the south.

On October 22, 1946, a Steller Jay (*Cyanocitta stelleri*) was seen in Boulder City. A race of this jay occurs on the Charleston and Sheep mountains west and northwest of Las Vegas, Nevada (Linsdale, Pac. Coast Avif. No. 23, 1936:84). The occurrence of this species forty miles to the east and at an elevation of only 2500 feet above sea level appears to be extremely unusual. This or another bird was also reported from the same locality a week later.—GORDON C. BALDWIN, Boulder City, Nevada, November 26, 1946.

Incubation in the Western Flycatcher.—The incubation period of the Western Flycatcher (*Empidonax difficilis*) is given by Bent (U.S. Nat. Mus. Bull. 179, 1942) and Bergtold (A Study of the Incubation Period of Birds, Denver, 1917) as 12 days, both authors presumably quoting Burns (Wilson Bull., 27, 1915:275).

The writer and his family arrived at their mountain cabin, in Gilpin County, Colorado, two miles south of Rollinsville, on June 25, 1946, after an absence of about a year. On the morning of the following day, June 26, a new nest of the Western Flycatcher was observed on an outside window ledge. The nest contained four eggs. The female bird, unaccustomed to human beings, was extremely wild and flushed from the nest each time the door closed or opened or when anyone passed. This went on for some days, the bird only gradually becoming accustomed to the presence of persons nearby.

On July 12 the eggs still remained unbroken. We thought that they might have lost their viability through chilling and therefore removed them for examination on July 13. One of the eggs was opened and disclosed a nearly-grown embryo, with very small yolk sac. The three remaining eggs were then restored to the nest and the bird resumed incubation. By the afternoon of July 14 two of the eggs had hatched, and on the morning of July 15 the third nestling had appeared. Thus a minimum of 19 days had elapsed before the last egg hatched.

This observation may simply indicate the persistence of viability of neglected eggs, but it also suggests a need for more observations and records of the incubation periods of our common birds.—HUGO G. RODECK, *University of Colorado Museum, Boulder, Colorado, December 12, 1946.*

Notes on Finches of the Genus *Carpodacus* in Western Washington.—Since Cowan's reports (Condor, 39, 1937:225; Murrelet, 25, 1944:45) of a breeding population of House Finches (*Carpodacus mexicanus*) at Victoria, Vancouver Island, it has been natural to expect records would be forthcoming for western Washington. In the spring of 1945 the species did appear near my home in Tacoma. There was no reappearance in 1946.

From April 30, 1945, when I first became aware of the visitor, to May 19 I saw or heard a lone red male nearly every day. These dates are thought to approximate rather closely the actual time of the bird's arrival and departure. It seemed to confine its movements to a rectangular area roughly one-third by one-eighth miles in extent and to follow a regular counter-clockwise path of travel, appearing in song quite regularly at half- to one-hour intervals each morning in the block just east of my home. In the hope that it might find a mate and perhaps nest, no effort was made to collect it, but detailed records of its appearance, notes, and behavior were made sufficient to establish its identity beyond doubt.

For several years the only record of the House Finch in the coastal belt between the Umpqua Valley of Oregon and southwestern British Columbia was that of a straggler at Forest Grove, Oregon, taken on March 21, 1932 (Gabrielson and Jewett, Birds of Oregon, 1940:539). This suggests that in all probability the southwestern British Columbia colony was established by birds coming from the expanding population east of the Cascades via the Fraser water gap and that the members of this colony continue to migrate over that route rather than by way of the Puget Sound-Willamette trough. The record for Tacoma may thus well be of a southward straggling bird from the British Columbia area. Mrs. J. G. Grove's belief (letter of September 17, 1946) that she has heard the linnet's song in Sedro Woolley bolsters this supposition. But Mr. Jewett (letter of September 11, 1946) cites the recent rapid expansion of the House Finch into northwestern Oregon (see Gordon, Condor, 1939:164; Jewett, Condor, 1940:169; Griffie, Murrelet, 1941:36) and believes that it is quite possible that the species now occurs "in Clark County, Washington, and north in the Chehalis Valley . . ." although evidence of this is still lacking.

The range of the Cassin Finch (*Carpodacus cassinii*) extends westward in Washington to the Hudsonian parklands of the Cascades and Mount Rainier, but so far as I am aware its presence in western Washington beyond this line has never been demonstrated. Miller and Curtis (Murrelet, 21, 1940:46) cite a Seattle record by E. J. Larrison of "one specimen observed on March 16, 1939," which I inquired about at the time in the hope of substantiating it. It turned out, however, that the identification was based only on sounds heard from a band of purple finches encountered in a fog. Mr. Larrison further cited an instance where a supposed specimen of the Cassin Finch was taken in his presence by E. S. Booth at Chase Lake, near Seattle. On examining this specimen, however, I found it to be a red male *Carpodacus purpureus*. The basis for Larrison's designation of the Cassin Finch as a "rare winter visitor" in the "Field Guide to Birds of the Seattle Area" (Seattle Audubon Society, 1942:22) is thus in doubt. The very recent inclusion of the Cassin Finch in a list of "Birds seen and heard on Lopez Island, Washington" between May 10 and 20, 1938 (Mr. and Mrs. J. G. Grove, Murrelet, 27, 1946:33-34) was based on a single field identification of a red male seen and heard in song near Fisherman's Bay on May 11 of that year (Mrs. Grove, *in litt.*). Mr. Walter Hagenstein notes the

extreme variability of the purple finches, and recalls specifically a flock of 125 seen in the Medina area last spring, six of which approached the Cassin Finch in coloration (letter of September 17, 1946). Although certain of the above records may be authentic, further evidence is necessary to establish the Cassin Finch in the list of western Washington birds save as a Cascade-Rainier form.—J. W. SLIPP, Tacoma Regional Museum, Point Defiance Park, Tacoma, Washington, September 30, 1946.

Present Status of the Green Heron in Washington.—In 1940, the writer summarized the status of the Green Heron (*Butorides virescens anthonyi*) in the state of Washington (Larrison, Murrelet, 21:1-3). Since then, a number of additional records of the bird have been obtained which, combined with several recently published notes, afford a more complete picture of the present distribution of the Green Heron in the state.

All records for Green Herons north of the Columbia River since 1940 pertain to the Puget Sound region. Of the eighty such observations and collections in that region, four were listed by Slipp (Condor, 44, 1942:35-36; 46, 1944:35-36) in the Tacoma-Steilacoom-Nisqually area, while the remainder were made in the Seattle district, mostly by H. W. Higman and/or Larrison. Some sixty records were made in the University of Washington marsh at Seattle.

A study of these data reveals several interesting facts. The Green Heron has been observed in western Washington during every month of the year except June. Most individuals were found from early July to late November, with scattered records from March, April, and May, and a small number of occurrences for January and February. Since 1940, Green Herons have been present regularly every year in the University of Washington marsh during the fall and early winter months. Several birds have often been encountered in that place at one time and one observer once reported twelve individuals in different parts of the marsh. A number of those birds seen in the fall were young of the year. Green Herons have also been noted at Green Lake in northern Seattle, at Beaux Arts on the eastern shore of Lake Washington, and on the Snoqualmie River, about twenty-two miles east of Seattle, all these localities being in King County.

An interpretation of the information now available would seem to indicate a northward spring migration through western Washington, a more lingering southward migration in the fall, and a tendency of some individuals to winter wholly or in part in the Puget Sound Basin. This would assume that Green Herons nest to the north of Seattle or, for that matter, some place in the Puget Sound area itself. Considering the large number of suitable nesting areas in western Washington and southwestern British Columbia and the paucity of bird observers, this situation could well exist undetected. Since the species was almost unknown in the state before 1938, it has apparently rapidly penetrated north of the Columbia River in recent years to become fairly well established west of the Cascades as a migrant and winter visitant and possibly as a summer resident.

This sudden northward extension of range becomes all the more remarkable when one recalls that in 1931 it was considered that the Green Heron "breeds or summers from Portland, Oregon, to northern Lower California, southern Arizona, and northern Sonora, Mexico. Winters from southern California to southern Mexico and central Costa Rica" (A. O. U. Check-list, 4th ed., 1931:30).—EARL J. LARRISON, Laboratory of Vertebrate Biology, University of Michigan, Ann Arbor, December 18, 1946.

Effects of a Hailstorm in the Black Forest, Colorado.—While conducting field work on breeding-bird populations in the Black Forest, Colorado, in June, 1945, I had an opportunity to make a survey of the effects of a violent hailstorm. The region under study was an open forest of western yellow pine, about fifteen miles northeast of Colorado Springs, with an elevation of between 7200 and 7300 feet. This area included a willow- and aspen-bordered creek.

On the afternoon of June 24, a rain and hailstorm of short duration, with a few stones one-half inch in diameter, occurred at 4:30 p.m. One hour later, a severe wind and electrical storm began and continued for thirty minutes. Hailstones ranging in diameter from one-half inch to one inch were common. The pines swayed violently in the wind, and small branches were broken off by the stones. The creek rose rapidly, and muddy water covered the wide, sandy bed for several hours. The adjacent willow bushes were bent and crushed by the force of the wind and hail.

The bird life on about eighty acres, which had been under regular observation, was surveyed immediately after the storm and on an early morning field trip the following day. A female Yellow Warbler (*Dendroica aestiva*) was found dead in her nest among the willows. She had been incubating four eggs. Her mate remained nearby for several days and continued to sing. A Robin (*Turdus migratorius*) nest, built against the trunk of a medium-sized pine, was deserted. The female had been seen incubating the eggs previously, but did not return. A Warbling Vireo (*Vireo gilvus*) nest, with one egg, was abandoned after the storm, although the pair remained in the vicinity for about a week. The nest had been constructed at the top of a clump of willows and was still intact. Another Warbling Vireo

nest, in an aspen, was likewise abandoned, but the adult birds were not seen later. A Solitary Vireo (*Vireo solitarius*) nest, suspended from a branch of a small pine, was found to be hanging from one side only, and one egg was broken on the ground beneath. Neither male nor female was seen again.—LOUISE HERING, *University of Colorado, Boulder, Colorado, December 23, 1946.*

Cause of Death of a Flammulated Owl.—On September 8, 1946, Walton Brown and I found a dead Flammulated Owl (*Otus flammeolus*) on a slope forested with lodgepole pine (*Pinus murrayana*) at an altitude of 9,500 feet near Jackson Lake in the Sierra Nevada of northeastern Fresno County, California. A bulky lump, which was evident in the throat of the owl, on autopsy proved to be a large long-horned grasshopper (family Tettigoniidae). Apparently the owl had attempted to swallow this insect head first. However, one of the long jumping legs had become twisted in such a manner as to lodge across the thorax of the insect. This increased its bulk to such an extent that it was unable to pass between the two arms of the wish bone. The owl might still have survived by disgorging its recalcitrant meal. However, the grasshopper's other legs with the abdomen formed a tangled mass which prevented this alternative and death resulted. Aside from the complications that arose, it would appear that this insect was rather large for the owl to swallow whole. It measured 3.3 cm. long by 1 cm. in diameter dried and not including the legs. However, it appears that grasshoppers and crickets are routine items in the diet of the Flammulated Owl (Jewett, Condor, 30, 1928:164; Marshall, Condor, 41, 1939:77; 44, 1942:66).

In addition to the long-horned grasshopper the stomach contents, which were saved and later analyzed, consisted of 4 crane flies (Tipulidae), 1 caddis fly (Trichoptera), 7 moths (Lepidoptera), 1 serpent fly (Raphidae), and 11 harvestmen spiders (Phalangida).

The owl was prepared as a study skin. Since it had apparently been dead for several days, minor decomposition prevented the determination of its sex.—KARL W. KENYON, *Mills College, Oakland, California, December 17, 1946.*

Belted Kingfisher Nesting in Ventura County, California.—Early in April, 1946, my boys informed me that a pair of Belted Kingfishers (*Megasceryle alcyon*) were digging a hole in a dirt bank along Sespe Creek, Ventura County, California, a short distance from my home. I immediately investigated and found the hole which was in the shade of a large eucalyptus tree; several low hanging branches of the tree were used as perches by the birds. The bank where the hole was found was about two hundred and fifty feet from the stream, and the entrance to the burrow was five feet two inches from the bottom and three feet seven inches from the top and measured four inches across and five inches high. The bottom of the burrow had a decided ridge in the center with a furrow on each side, evidently made by the birds' feet in going into the nest cavity.

On May 3, 1946, we decided that there should be a full set of eggs, so we used a trout rod to determine the depth of the hole, which we found to be about seven feet. The hole curved so that we could not see to the end. Digging to one side of the hole, we broke through to the nest cavity. One of the birds flushed from the entrance and on examining the cavity, which held no nesting material, I found seven fresh eggs lying on the bare ground about eight inches from the rear end of the hole. The eggs are distinctly larger than eggs of eastern Belted Kingfishers and measure in inches, 1.510×1.135 , 1.545×1.147 , 1.531×1.141 , 1.421×1.132 , 1.460×1.130 , 1.439×1.131 , 1.431×1.149 . This is, to my knowledge, the first nesting record for the species in Ventura County.—SIDNEY B. PEYTON, *Fillmore, California, December 23, 1946.*

Orange-crowned Warbler Wintering in Oregon.—On January 11, 1947, while investigating my bird traps in Eugene, Oregon, I found a dark olive-green warbler in a government sparrow trap. Upon closer examination it proved to be a dark form of the Orange-crowned Warbler (*Vermivora celata*). It was banded (46-23907), weighed (8.74 gms.), and released.

It is regretted that this bird was not saved as a specimen, since it may have been of the race *V. c. celata*, which is considered a rare bird in Oregon (see Jewett, Condor, 48, 1946:285).—GORDON W. GULLION, *Eugene, Oregon, January 22, 1947.*

Notes on Mississippi Kites in Hemphill County, Texas.—Allan and Sime (Condor, 45, 1943:110-112) reported on the distribution of Mississippi Kites (*Ictinia mississippiensis*) in the Panhandle of Texas. They stated that there might be assumed to be a pair or more of these birds per square mile in optimum habitat. The conservatism of this assumption was shown by a study made August 14-22, 1946. An area of 575 acres of federally-owned land about 14 miles east of Canadian, Hemphill County, Texas, was found to have in residence 34 adult (seemingly 17 pairs) and 15 young kites. The latter were associated with 10 pairs of adults. From a suitable spot on the area late in the afternoon of August 21, 24 of the 49 resident birds were simultaneously in view.

As late as August 18, one young bird was still in the nest, although the other young observed were awing, most of them capturing their own food. Since Mississippi Kites leave the Panhandle (Allan and Sime, *loc. cit.*) by the end of September, it seemed likely that the late nestling was doomed. At any rate, it was killed and eaten in the nest—presumably by one of the abundant raccoons—on the night of the 18th. From the remains, it was determined to have been a female. Other nests were found but not examined.

Cicadas appeared to play a prominent role at this season in the food habits of the kite. These insects were abundant. On several occasions I flushed cicadas from clumps of grass or shrubs. A nearby kite, with a "stoop" like that of a falcon, would seize the insect within 50 feet of me. The impact of foot with insect was distinctly audible at that distance. I tossed a number of cicadas and large grasshoppers into the air, but, despite attempts by several birds, only a single Kite succeeded in catching one of the insects.

Dragonflies and grasshoppers were seen to be captured. The most unusual food item observed, however, was a small bat brought to a treetop over my head. The bird and its prey were carefully observed with binoculars at 50 feet. Judging from its size and tawny coloration, I believe the bat may have been a pipistrelle. Bats, to my knowledge, have not been reported previously as food of the Mississippi Kite. This species, by contrast with the White-tailed Kite (*Elanus leucurus*), appears to take little mammalian prey.—PHILIP F. ALLAN, *Soil Conservation Service, Fort Worth, Texas, January 13, 1947.*

Violet-crowned Hummingbird in Arizona.—The late H. H. Kimball collected large numbers of hummingbirds in the Chiricahua Mountains near Paradise, Arizona. The majority of these he had identified correctly, but in the collection which I acquired was one he evidently recognized as especially rare, since he had made a small wooden coffin-like box, just fitting the bird, in which he had carefully placed the skin, and then had packed it among a number of Arizona Blue-throated and Rivoli hummingbirds collected at about the same time. This specimen, a male obtained on July 16, 1925, has an azure blue forehead and crown, back dusky with faint greenish gloss, tail with greenish cast, primaries dusky glossed with violet, an immaculately white chin, throat, breast, and belly, and white undertail coverts with dusky central portions. Dr. Alexander Wetmore identified the skin as *Amazilia violiceps ellioti*, the Northern Violet-crowned Hummingbird.

Kimball's specimen is an almost exact duplicate of one in my collection taken by Berry Campbell on July 11, 1935, about 95 miles south of Paradise, Arizona, at El Tigre Mine, Sonora, Mexico, labeled "male, juv." Van Rossem (Occ. Papers, Mus. Zool., Louisiana State Univ., 21, 1945:306) has given this location as "lat. 30° 37'; long. 109° 20'; alt. (probably over) 5,000 feet." The latter specimen was also identified by Dr. Wetmore as *Amazilia violiceps ellioti* and apparently represents the most northern record for Mexico.—MAX M. PEET, *Ann Arbor, Michigan, January 7, 1947.*

Bird Notes from Southeastern Arizona.—*Aix sponsa*. Wood Duck. We can find no published report of the occurrence of the Wood Duck in the state of Arizona. Hargrave (Museum Notes, Museum of Northern Arizona, 9, 1936:30) stated that "it is rumored to have been seen near Flagstaff," but he gave no details.

On November 20, 1941, at sunset, we saw a male Wood Duck in Binghamton Pond, six miles northeast of Tucson, Arizona. The light was rather poor as we watched the bird with 8x binoculars at a distance of about 200 feet. None of the bright colors could be distinguished but the pattern of light and dark areas was clearly seen. Two females swimming close to the male may also have been of this species, although positive identification in the increasing shadows was impossible.

On November 23 we visited the pond again. No ducks were seen, but we found a number of fresh, brightly-colored feathers scattered in a small area on the bank near the water. It appeared that some predator had torn some feathers off its prey at this spot before carrying it away. We collected the feathers and sent them recently to Dr. Alden H. Miller for identification. We are indebted to Dr. Miller who, in his letter of November 1, 1946, states that these feathers "are indeed those of a Wood Duck. Some of them compare very closely with the peculiarly marked flank feathers of this species. I do not believe there is anything else that could be confused with them. The feathers from other areas of the body likewise correspond."

Chlidonias nigra. Black Tern. We saw seven at Willcox Playa, Cochise County, August 13, 1946. Six were in summer plumage; the seventh was either an immature or an adult in winter plumage. There are only a few published records of the Black Tern for this area.

Tyto alba. Barn Owl. Swarth (Pac. Coast Avif. No. 10, 1914:29) regarded this owl as rare in southern Arizona. On May 2, 1934, Anders H. Anderson found a dead, dried bird at Binghamton Pond,

six miles northeast of Tucson. On April 14, 1946, he observed a Barn Owl roosting in the top of a tall cottonwood tree near the Santa Cruz River, eight miles south of Tucson.

Tyrannus melancholicus. West Mexican Kingbird. This species was first reported breeding near Tucson in 1938 and 1939 by Phillips (Auk, 57, 1940:117). We found this species still present along the Santa Cruz River near San Xavier Mission on August 2, 1946. Two adults and a fledgling were seen.

Sayornis nigricans. Black Phoebe. Swarth (*op. cit.*:41) listed no breeding records for the Lower Sonoran Zone. On May 21, 1939, two adults were seen making frequent trips with food into a well on a farm six miles south of Tucson. On May 30, 1946, two adults were seen feeding a full grown young bird along the Santa Cruz River near Sahuarita Butte.

Certhia familiaris. Brown Creeper. There seem to be no published winter records for southern Arizona. On January 6, 1946, we watched a creeper in a willow tree for several minutes in Lower Sabino Canyon, Santa Catalina Mountains. This is well within the Lower Sonoran Zone also.

Telmatoodytes palustris. Long-billed Marsh Wren. Swarth (*op. cit.*:75) lists no winter records for Arizona. We saw small numbers of this species at Binghamton Pond almost every winter from 1932 to 1945. Our earliest arrival was on September 30, 1945; latest departure was on April 22, 1933. The recent growth of cattails in the artificial lake in Lower Sabino Canyon sheltered several wrens during the winter of 1945-1946.

Spinus pinus. Pine Siskin. No Lower Sonoran winter records are listed by Swarth. Anders H. Anderson saw from one to thirty individuals on the following dates at Binghamton Pond: February 13, 1933, January 23, 1935, January 3 and 23, February 11, 1936, December 27, 1937, November 12, 1939. An early migrant (?) was seen July 30, 1946, in company with two Green-backed Goldfinches (*Spinus psaltria*) along Highway 83, about five miles from Sonoita, just north of the Santa Cruz County line. The surrounding area is chiefly Upper Sonoran grassland.

Pipilo maculatus. Spotted Towhee. We have the following Lower Sonoran Zone records: One was seen March 20, 1933, in the vicinity of old Fort Lowell, northeast of Tucson. On November 11, 1945, one was seen in hackberry brush in Lower Sabino Canyon. On December 30, 1945, one was seen in the brush beneath the cottonwoods along Sonoita Creek about a mile south of Patagonia, Santa Cruz County. On January 26, 1946, one was seen at Binghamton Pond.—ANDERS H. ANDERSON and ANNE ANDERSON, Tucson, Arizona, November 7, 1946.

Baikal Teal Taken in California.—A Baikal Teal (*Anas formosa*) was shot near Calipatria, Imperial County, California, on December 29, 1946, by Albert Washart of Roscoe, California. This bird was flying alone over a shallow, grassy fresh-water pond at the south end of the Salton Sea when shot. The skin has been donated to the Museum of Vertebrate Zoology.

The Baikal Teal is found in eastern Siberia, wintering south to Japan and China. There are four previous records from North America; three of these are from Alaska (Bailey, Auk, 50, 1933:97) and one from Brentwood, Contra Costa County, California (Moffitt, Condor, 34, 1932:193; and Swarth, Condor, 34, 1932:259).—JOHN LAUGHLIN, California Division of Fish and Game, Riverside, California, January 22, 1947.

NOTES AND NEWS

The Annual Meeting of the Cooper Ornithological Club will be held May 30 and 31 and June 1 in Los Angeles. Members are urged now to plan to attend and to contribute to the scientific program.

The life-time collections of birds, birds' eggs and nests of the late Milton S. Ray of San Francisco have recently been donated to the Museum of Vertebrate Zoology of the University of California by Mrs. Ray. The collection is rich in material from Guerrero, Mexico, northern South America, Africa and the Philippine Islands. The Guerreran material, assembled and prepared by the veteran collector W. W. Brown, is the most extensive single collection thus far made in that section of Mexico. A number of rarities among extinct or nearly extinct birds are included in the Ray collections: Passenger Pigeon, Carolina Paroquet, Eskimo Curlew, Ivory-billed Woodpecker, skeleton of the Great Auk, and eggs of *Aepyornis* and *Dinornis*. The specimens have been moved to the Museum in Berkeley and are being arranged preparatory to cataloguing.

PUBLICATIONS REVIEWED

"The Atlantic Alcidae. The Seasonal and Geographic Variation of the Auks Inhabiting the Atlantic Ocean and Adjacent Waters," by Finn Salomonsen (Göteborgs Kungl. Vetenskaps- och Vitterhets-samhälles Handlingar, Sjätte Följden, Ser. B, Band 3, N:o 5, 1944:1-138, 24 figs.) is intended as a general review of the Atlantic auks, "with a final arrangement of all known geographical forms." Results are based primarily on a study of nearly seven hundred and fifty specimens in Scandinavian museums. The work contains a wealth of valuable factual material, particularly on size and color variations in different populations, on the time and sequence of molts, and on age and seasonal variations in bill size and proportions. Also noteworthy are discussions of such "mutant" forms as the ringed murre, the black-winged guillemot, and the dwarf puffins, and of the variations in frequency of occurrence of these "mutants" from one population to another. The paper is in English.

Several of Salomonsen's methods and conclusions should, however, be questioned. Two races of the razor-bill auk, *Alca torda torda* and *A. t. pica*, are separated solely on the basis of the number of furrows distal to the vertical white stripe on the bill. Using this character, only sixty-two per cent of the specimens of *pica* and fifty-five per cent of the specimens of *torda* are found to be distinguishable. The practicality of such a split is doubtful. Indeed, it is unfortunate that nowhere in the paper are modern statistical meth-

ods used to evaluate the significance of the variations described.

Cepphus grylle ultimus is described as new in this paper. The type series was apparently examined several years before the description was written, and the latter was drawn up from measurements published by Horring in 1937. The propriety of choosing the extreme of the series for the type, as was done in this instance, is also questionable.

Throughout the paper the author assumes that wing length is an accurate index of body size. This may be a safe assumption in many groups, but in the Alcidae there are several selective factors involved in the evolution of populations with relatively long or short wings. The migratory habit of the high Arctic forms would tend to produce relatively long-winged forms whereas sedentary forms which use their wings comparatively little for flight would tend to have relatively short wings as proportionately short wings have a positive selective value for underwater use. It would be advisable to compare variations in wing length with total weight or some body measurement to test the validity of his assumption.

In his brief treatment of the Pacific forms of *Cepphus*, Salomonsen does not hesitate to make *grylle* and *columba* conspecific. Peters, in his "Check-list of Birds of the World" (vol. 2, 1934: 354) lists Herald and Wrangel islands as breeding places of both *C. c. columba* and *C. g. mandtii*. Peters' statement may not be true, but it is unfortunate that Salomonsen did not consider this matter, for if both forms do breed on these islands, this has an important bearing on the question of whether or not the two forms are distinct species.

The author also states that *Uria aalge californica* is restricted to the Farallon Islands. Actually, *californica* nests all along the Pacific coast from Monterey County, California, north to Washington, where it intergrades with Salomonsen's race *inornata*.

Finally, the absence of North American material in the lists of specimens examined prevents one's considering this a definitive work.—ROBERT W. STORER.

COOPER CLUB MEETINGS

SOUTHERN DIVISION

JANUARY.—The monthly meeting of the Southern Division of the Cooper Ornithological Club was held in Room 145, Allan Hancock Foundation, University of Southern California, Los Angeles, on January 28, 1947, with 54 members and guests present. The following names were proposed for membership: Dr. John S. Garth, Allan

Hancock Foundation, University of Southern California, Los Angeles 7, Calif., and Warren Henry Morton, 9970 Sharp Ave., Pacoima, Calif., by Sherwin F. Wood; Mrs. Margaret Rose Harding, 526 S. Van Ness Ave., Santa Ana, Calif., by Marjorie Jane Moody; Dr. Locke Mackenzie, 903 Park Ave., New York 21, N. Y., by Junea W. Kelly; George G. Williams, The Rice Institute, Houston, Tex., by Frank G. Watson; John Kenneth Terres, 251 E. 48th St., New York 17, N. Y., by Alden H. Miller; Bill Russell Lower, 638 S. Duncan Ave., Los Angeles 22, Calif., by Kenneth E. Stager; Mrs. Herbert E. Carnes, 25 Kenwood Rd., Tenafly, N. J., by Mrs. N. Edward Ayer; David K. Weatherbee, 11 Dallas St., Worcester 8, Mass., and Elizabeth Caroline Lum, Cincinnati, N. Y., by John McB. Robertson; Bert Roberts, 2318 Ashmead Place, N. W., Washington, D. C., by Wilson C. Hanna; Liven Adam Peterson, Jr., 731 Burlington, Billings, Mont., John Monroe Cowan, Jr., P. O. Box 503, Goldthwaite, Tex., Herbert Berger Hammer, Terrace, B. C., Canada, Macrae Pollock, 10418 97th Ave., Edmonton, Alta., Canada, and Edgar N. Stone, 2360 Pacific Ave., San Francisco 9, Calif., by W. Lee Chambers; Cyril E. Abbott, Zoology Department, North Dakota Agricultural College, Fargo, N. D., Humayun Abdulali, Faiz and Co., 75 Agduldrehman St., Bombay 3, India, Herbert G. Adams, 402 N. 17th St., Corvallis, Ore., Irwin Alperin, 1650 Ocean Ave., Brooklyn 30, N. Y., Benoît Asselin, Vimy Ridge Mine, Mégantic, Québec, Canada, David A. Aylward, 20 Spruce St., Boston, Mass., Dr. S. Glidden Baldwin, 139 N. Vermilion St., Danville, Ill., William Baxter, Mayfair Apts. C-503, Wilmington, Delaware, John Alden Biddle, 16811 Fernway Rd., Shaker Heights, 20, O., Roger Grafton Shelford Bidwell, 329 Quinpool Rd., Halifax, N. S., Canada, Edna L. Bishoff, 341 S. Alvarado, Los Angeles 5, Calif., Charles H. Blake, Lincoln, Mass., Araminta Blanchard, 545 S. Hobart Blvd., Los Angeles 5, Calif., Mrs. Myrtle Braman, 206 W. Stayton Ave., Victoria, Tex., Fred R. Cagle, Zoology Department, Tulane University, New Orleans 15, La., Edward Jay Court, 1723 Newton St., N. W., Mt. Pleasant, Washington, D. C., James Lee Cox, Box 950, State Garm Farm, Carlsbad, New Mexico, Charles Ernest Cutress, Rt. 16, Box 132, Milwaukie, Ore., Angelo Ralph D'Angelo, 809 Palisade Ave., Union City, N. J., W. M. Davidson, P. O. Box 66, Laurel, Md., Carroll L. Davis, Lakeport, Calif., Dr. Edwin Griffith Davis, 3310 35th St., N. W., Washington 16, D. C., Lt. William Bruce Dean, 534 Fruit Hill Ave., N. Providence 11, Rhode Island, Donald Gordon De Lisle, 90 Seventh St., Ashland, Ore., Hubert Raymond Doering, 2 Midland Gardens, Bronxville 8, N. Y., Benjamin Einhorn, 7 Parker Ave., Deal, N. J., Theodore Lyman Eliot, Belvedere, Marin County, Calif., Rudolph Fischer, Bonita Union High School, 215 E. Foothill Blvd., La Verne,

Calif., Herman John Goebel, 7852 80th St., Brooklyn 27, N. Y., Mrs. C. J. Grace, Slingerlands, Rural Del., N. Y., Robert Grayce, 141 Main St., Rockport, Mass., George Edward Grube, 611 N. Lime St., Lancaster, Pa., Stuart Kimball Harris, 33 Lebanon St., Winchester, Mass., Roland Walter Hawkins, Division of Biology, National Museum of Canada, Ottawa, Ont., Canada, The Anna Head School, 2538 Channing Way, Berkeley 4, Calif., Mrs. Charles W. Holton, Essex Fells, N. J., E. Bryan Jacobs, Waynesburg, Pa., Mrs. J. Frank Key, Buena Vista, Va., Peter Koch, Marathon, Tex., Mrs. Arthur Koehler, 109 Chestnut St., Madison 5, Wis., George Macrae Lacey, 729 College St., Jackson, Miss., Robert N. Lake, Woodstock, Vermont, John D. Latin, 5726 W. Ohio St., Chicago 44, Ill., John E. Lieftinck, 1826 W. Market St., Akron 13, O., M. Albert Linton, 315 E. Oak Ave., Moorestown, N. J., William W. Lukens, Jr., 1711 Spruce St., Philadelphia 3, Pa., Alice S. Marionneaux, Box 262, Plaquemine, La., Harold Ford Mayfield, 2557 Portsmouth Ave., Toledo 12, O., Mrs. Lena McBee, 3813 Memphis St., El Paso, Tex., John J. Moore, 133 Blue Hills Parkway, Milton, Mass., Mrs. John Morrow, Jr., 1320 N. State St., Chicago 10, Ill., Walter Prine Nickell, Cranbrook Institute of Science, Bloomfield Hills, Mich., Mrs. Henry J. Nunnemacher, 2815 E. Newberry Blvd., Milwaukee 11, Wis., George Parmlly, Box 141, Orange, N. J., Claremont G. Pritchard, Juniata, Neb., William Lloyd Putman, Dominion Entomological Laboratory, Vineland Station, Ontario, Canada, Edwin Arthur Springer, Manteca Union High School, Manteca, Calif., Rev. Charles A. Chamberlin, 119 N. Chestnut St., Palmyra, Pa., Frederick Graham Cooch, 685 Echo Dr., Ottawa, Ontario, Canada, Mary Evelyn Ferguson, 5907 Mason St., Omaha 6, Neb., Anne Merrill, 4 Prince Arthur Ave., Toronto, Canada, James Bishop Peabody, Princeton, Mass., and Kenneth Wade Prescott, Museum of Zoology, University of Michigan, Ann Arbor, Mich., by C. V. Duff; Clarence C. Beasley, 614 California Ave., Santa Monica, Calif., by Hildegard Howard; and Walter J. Fitzpatrick, Yosemite National Park, Calif., by Sidney B. Peyton.

Hildegard Howard reporting for the nominating committee, presented the following names for officers for the ensuing year: President, C. V. Duff; Vice-president, Kenneth E. Stager; Secretary, Dorothy E. Groner. The officers proposed were elected.

Dr. John S. Garth showed Kodachrome motion pictures taken by Julian Vogt of Nahuel Huapi and Falls of the Iguazu, National Parks in South America, and spoke of some of the differences in conservation practices in National Parks in South America as compared with those in our own country.—DOROTHY E. GRONER, Secretary.

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WANTED—Two numbers of *The Oologist*: number 11 of volume 35 (1918); number 11 of volume 36 (1919). I am willing to pay \$5.00 for each number.—OLIN SEWALL PETTINGILL, JR., Carleton College, Northfield, Minnesota.

FOR SALE—*The Condor*, vol. 1 (1899), numbers 1, 2, 4 and 5; years 1901 to 1910, inclusive, with 26 numbers missing; 1911 to 1946, with only 3 numbers missing; total 251 numbers, for \$125.00. Bent's, Bulletin 146, Part 2; 162; 167, Part 1; at \$3.00 each. Ridgway's Bulletin 50, Parts 1, 4, 5, 6, 7 and 8, six parts, \$20.00. Murrelet, 1920 to 1946, inclusive, four numbers missing, \$50.00. Dawson's Birds of California, Booklovers' Edition, Parts 1 and 2, \$10.00. All the above prepaid.—DR. H. C. NICKELSEN, Rt. 2, Box 403, Tacoma, Washington.

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